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Tank Training,

Vol. II, Part III

Pamphlet No. 1

ORDNANCE Q.F. 3-POUNDER, 2-CWT. MARKS I AND II GUNS

AND

ORDNANCE Q.F. 3·7-IN. MARK I MORTAR

1936

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H. J. Creedy
P.O.

THE WAR OFFICE,
30*th November*, 1936.

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TANK TRAINING, VOL. II, PART III

PAMPHLET NO. 1

ORDNANCE Q.F. 3-POUNDER, 2-CWT. MARKS I AND II GUNS AND ORDNANCE Q.F. 3·7-IN. MARK I MORTAR

1936

1. INSTRUCTIONAL NOTES

The following general sequences and methods of instruction are applicable to all lessons * contained in this book :—

Preparation.—The class, and everything required for the lesson, must be in position.

Demonstration.—A demonstration of the action which the lesson is intended to teach.

Explanation.—A brief description of the action demonstrated.

Imitation.—Students copy the action of the instructor.

Interrogation.—A cross-examination of students to ascertain that all points of the lesson have been understood.

It is important to note, however, that it would be incorrect in *all lessons* rigidly to adhere to this sequence. In some lessons, for example, it will be desirable to combine demonstration and explanation ; on other occasions, *imitation or interrogation* may be unnecessary. The main points to observe are that the students fully understand the purport of the lesson and, where necessary, are capable of performing any manual operation involved. Unnecessary demonstrations and explanations should be avoided and the instructor must concentrate on *practising* the student, so that the requisite degree of manual skill is attained.

Imitation may be omitted from the sequence in lessons on mechanism, and the time devoted instead to *interrogation*.

* NOTE.—A lesson does not necessarily represent a period of training. Some lessons may require only a few minutes.

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2. GENERAL INTRODUCTION TO THE WEAPON.

1. General instructional notes.

i. No attempt should be made to teach the general description of the gun as given in this chapter and in the " 3-Pr. Handbook."

ii. The student should first see the gun in its service mounting together with the co-axially mounted ·303-in. M.G., and appreciate their relationship to the armament of the vehicle as a whole. The first lesson should, therefore, be carried out on a gun mounted in an armoured fighting vehicle, whenever possible.

2. Equipment required.

i. One drill cartridge.
ii. Set of tools, Mark I or II.
iii. Telescope.
iv. Belt, dummies, and belt box.

3. Investigation.

The instructor will show the gun to the crew (recruits only) and leave them for about ten minutes to attempt to discover, unaided, how the 3-pr. is loaded, fired and unloaded. He will then interrogate on these points, clear up any misconceptions which may have arisen at the investigation and then commence instruction.

NOTE.—If the first lesson on the machine gun has not previously been dealt with, the instructor will include the co-ax. gun in the investigation.

4. Sequence of instruction (introduction to the weapon).

i. *Name.*

(*a*) Ordnance, Q.F. 3-pounder, 2-cwt. : Mark I in medium tanks, Marks I, Ia and Ia*.

(*b*) Ordnance, Q.F. and S.A. 3-pounder, 2-cwt. : Mark II, in medium tanks, Marks II, II* and IIa.

(*c*) Q.F. (Quick Firing), because the propellant charge is contained in a metal cylinder.

(*d*) S.A. (Semi-Automatic). The Mark II gun is semi-automatic. When the operating lever on the mounting is set in the S.A. position, it causes the breech to open as the gun runs out after recoil.

The breech is closed in loading by the breech closing spring.

(*e*) 3-pounder.—The weight of the shell fired is approximately 3 lb.

(*f*) 2-cwt.—The gun, with breech block, weighs approximately 2-cwt.

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ii. *Calibre.*—1·85-ins.

iii. *Muzzle velocity.*—Mark I ... ... 1,750 f.s.
Mark II ... ... 1,850 f.s.

iv. *Extreme range.*—Mark I ... ... 6,000 yards.
Mark II ... ... 7,000 yards.

v. *Rate of fire.*—The rate of fire depends upon :—

(*a*) The regularity of the ground.

(*b*) The skill of the gunner, loader and driver.

In favourable circumstances it may be possible to fire 8 to 10 well aimed rounds a minute.

vi. *How operated.*

Left hand.—The gun is elevated and depressed by the firing and elevating handle on the left of the gun.

Right hand.—The traversing wheel below the gun, rotates the turret through 360 degrees.

The gun is fired by means of the mechanism on the firing and elevating handle. On firing the gun recoils 10·5-ins. This movement is regulated by the hydraulic buffer. It is repositioned after recoil by two strong running out springs. The gun crew consists of two men, one gunner and one loader.

vii. *Ammunition.*

The following types of projectiles are in use :—

(*a*) Mark I A.P. service shell, filled with shellite or lyddite, for use against targets invulnerable to small arms fire.

The lyddite filled shell is painted yellow, with two white and one red rings at the front end. The white rings denote that the shell is A.P. and the red ring that the shell is filled.

The shellite filled shell is similar in colour with the exception of the tip, which is painted green.

(*b*) A.P. practice projectile filled with black powder. The shell is painted black with two white and one red rings at the front end and a yellow ring, denoting " practice shell," is painted around the body.

(*c*) Mark I practice projectile filled with black powder. A cast-iron cap is screwed on to the front of the steel body. The latter is drilled at the top to allow air to reach the filling, when the cast-iron nose cap breaks off. The shell is painted black, with one red ring at the front end and a yellow ring about the centre.

(*d*) Mark VII Hotchkiss base percussion fuze, designed to explode the shell on graze or impact, is fitted in the base of all the above types of shells.

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(*e*) A flat-headed solid shot. A brass tube, fitted to the base of the shot, contains a substance which being ignited on firing acts as a tracer.

All types of shell will in future be fitted with a similar tracer fitted to the body of the base fuze.

viii. *Spare parts.*—Sufficient spares are supplied for normal replacements, together with the necessary tools for stripping purposes.

ix. A brief description of the following points, relating to the co-axially mounted machine gun will be given :

(*a*) Name.—·303-in. Vickers M.G. Mark VI, Mark IVa or Mark IVb.

(*b*) Mounting.—

(*a*) Position of the co-ax. in relation to the telescope and 3-pr.

(*b*) How the co-ax. conforms to the movement of the 3-pr.

(*c*) Firing gear and change-over mechanism.

(*c*) Demonstration.—The instructor will demonstrate the loading, firing, and unloading of the co-ax. and 3-pr. guns. He will not enter into any detailed explanation.

3. STRIPPING—MARKS I AND II GUNS

1. General remarks.

i. Owing to the limited space in an armoured fighting vehicle, great care must at all times be exercised in the handling of the gun and components.

ii. Defects and breakages are normally rare. In the majority of cases damage is due to neglect on the part of the gunner.

iii. No direct hammer blows are necessary by the gunner on any part of the gun when stripping or assembling.

iv. Great care must be exercised when removing or replacing screwed axis pins : before attempting to remove, ensure that the threads are disengaged. No force is required when replacing the screwed axis pins.

v. Incorrect use of tools will cause damage, therefore the various parts of the gun will be stripped only with the special tools provided.

vi. Before beginning any stripping, the gun must always be **unloaded.**

vii. Operations marked with an asterisk will only be performed by an artificer.

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viii. For full details of stripping, see " 3-Pr. Handbook," pages 49–52 (Mark I) and 66–68 (Mark II).

2. Dismantling the breech block from the gun and replacing it, Marks I and II guns.

MARK I	MARK II
i. Extractors.	i. The co-ax. gun, if fitted, must first be removed from its mounting.
ii. Remove breech block.	ii. See that the breech block is in the closed position and the firing mechanism eased.
iii. Fire the mechanism.	iii. The fittings will now be removed in the following order— (*a*) Striker case with striker. (*b*) Open the breech and remove the keeper pin from the nut securing actuating cam. Close the breech and remove the nut securing actuating cam, and cam. (*c*) Elevate the gun. (*d*) Remove the actuating shaft: the disengaged hand holding the B.M.L., which becomes free when the shaft is removed. (*e*) B.M.L. and rack pinion. (*f*) Level off the gun. (*g*) Breech block and extractor levers. (*h*) Cocking link actuating pin, crank and striker cocking link.

TO ASSEMBLE

i. Replace the breech block.	i. Striker cocking link, crank, and cocking link actuating pin.
ii. Extractors.	ii. Breech block and extractor levers.

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MARK I	MARK II
Fire the mechanism.	iii. B.M.L. and rack pinion. iv. Elevate the gun and replace actuating shaft; ensure that the B.M.L. and rack pinion do not fall off. v. Level off the gun and replace actuating cam and securing nut. vi. Open the breech and replace the keeper pin of the nut securing actuating cam. Close the breech. vii. Striker case with striker. NOTE.—For a 3-pr. gun, fitted with a Mark I type of actuating shaft, it will be necessary to run the gun back before removing or replacing the actuating shaft.

3. Stripping the firing mechanism and re-assembling it.

MARK I	MARK II
i. Cocking handle.	i. Cocking handle.
ii. Striker, cocking sleeve, and striker cocking cam.	ii. Striker spindle, with firing pin, main spring and cocking sleeve.
iii. B.M.L.	iii. Plunger retaining striker casing.
iv. Mainspring, and striker spindle with firing pin.	iv. Trigger sear and spring.
	v. Safety catch.

RE-ASSEMBLE IN THE REVERSE ORDER

NOTES.—1. Mark I gun. Before beginning this lesson the breech block will be removed from the gun.

2. Marks I and II guns. The firing pin will not be removed in this lesson.

4. Stripping other parts.

MARK I	MARK II
i. Firing lever with firing bar.	i. Breech closing spring and rack.
ii. Retaining catch lever.	ii. Retaining catch lever.

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MARK I	MARK II
iii. Trigger sear, plunger and spring.	iii. Firing lever.
iv. Firing hole bush.*	iv. Firing hole bush.*

RE-ASSEMBLE IN THE REVERSE ORDER

5. Changing the firing pin.

MARK I	MARK II
i. Remove the breech block.	i. Remove striker case with striker.
ii. Set safety catch at "Safe" and remove the B.M.L.	ii. Remove staple and firing pin.
iii. Remove staple and firing pin.	
NOTE.—If the firing pin cannot be removed with the pliers, turn the cocking handle counter clock-wise, until the index line is at 6 o'clock; set the safety catch at "Fire" and fire the mechanism by pressing in the upper arm of the trigger sear, taking care not to damage the point of the firing pin. The firing mechanism may now be stripped down. The firing pin can then be removed with the No. 18 drift.	NOTE.—If the firing pin cannot be removed by means of the pliers, strip down to and including the spindle striker. The firing pin can then be removed with the No. 18 drift.

6. Removing the gun from the mounting and replacing it.

i. Three men in addition to the instructor or N.C.O. supervising the operation, are required.

The turret will be traversed until the gun is in line with the rear or side door, and the turret clamped.

The crew will be placed as follows: N.C.O.—at the elevating handwheel; No. 1—outside the tank; No. 2—In position on the left of the breech recess; No. 3—In position on the right of the breech recess.

* To be carried out by, or under the supervision of, an artificer.

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ii. *Removal of gun.*

MARK I

(*a*) Breech block.
(*b*) Deflector.
(*c*) Gun lug nut.

MARK II

(*a*) Breech block.
(*b*) Guard tray.
(*c*) Deflector.
(*d*) Gun securing nut.
(*e*) Withdraw gun until the threads on the jacket are just clear of the cradle.

NOTE.—Great care must be taken to ensure that the threads on the jacket are not damaged.

The supervising N.C.O. will now elevate the gun and direct its removal. The gun will be controlled by No. 1 at the muzzle, and Nos. 2 and 3 at the breech end. No. 1 will enter the tank as soon as possible to assist in lowering the gun to the floor of the tank. Special care must be taken to ensure that the muzzle is supported as the guide leaves the guide-way. The Mark I gun should be turned on its left side to avoid damage to the firing lever. The Mark II gun will be turned on its right side.

iii. *Replacing the gun.*

The gun will be replaced in the reverse order with particular attention to the following notes :—

MARK I

(*a*) With one man at the muzzle and two men at the breech, raise the gun and replace it in the mounting. Ease the gun forward until the guides engage in the guideways. No. 1 will then proceed outside the tank and support the gun from the front.

(*b*) The mounting will then be depressed by the supervising N.C.O. and the gun eased forward at the same time.

(*c*) The gun lug nut, keep pin, deflector, breech mechanism, etc., will be replaced, and the gun traversed to the front.

MARK II

(*a*) With one man at the muzzle and two men at the breech, raise the gun and replace it in the mounting until the threads on the jacket are just clear of the mounting. No. 1 will then proceed outside the tank and support the gun from the front.

(*b*) As for Mark I.

(*c*) Replace the gun securing nut, deflector, cartridge case tray, breech mechanism, etc., and traverse the gun to the front.

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MARK I

(*d*) If the gun is being mounted for the first time, care must be taken to ensure that the key on the buffer cylinder is in line with the key-way on the gun lug.

7. Method of instruction.

i. *Object.*

To teach the correct method of stripping for cleaning or for replacing a broken or damaged part.

ii. *Equipment required.*—

Hammer.
Pliers.
Screwdriver, large.
Screwdriver, small.
Spanner, adjustable, large.
Drift, No. 18 (for removal of firing pin).
Spanner, No. 391 (for gun securing nut, Mk. I gun).
Tommy, actuating shaft (Mk. II gun).
Wrench, body securing nut (for Mk. II gun and 3·7-in. mortar).
Wrench, breech mechanism, No. 279 (for actuating shaft nut, Mk. II gun).

NOTE:—The tools, etc., described below are issued for the following purposes:—

Gauge, protrusion, striker, Mk. I.
Funnels, filling, cylinder, No. 10, Mk. I (for buffer, Mk. I gun).
Funnels, filling, cylinder, No. 11, Mk. I (for buffer, Mk. II gun).
Screwdriver, adjusting sights.
Screwdriver, 2¾-in. (for snifting valve, Mk. II gun).
Spanners, No. 387, Mk. I, for adjusting co-ax. firing gear).
Spanners, No. 386, Mk. I (for spindle, valve, adjusting, run-out, Mk. I gun).
Spanners, No. 416, Mk. I (for spindle, valve, adjusting, run-out, Mk. II gun).
Spanners, No. 215, Mk. I (for breech, closing spring, Mk. II gun).
Spanners, No. 385, Mk. I (for gland and stuffing box, valve, adjusting, run-out).
Spanners, No. 247, Mk. I (for firing hole bush).
Caps, sponge, No. 16, Mk. I.

iii. *Sequence of instruction.*

Instruction in stripping will be given in the sequence set out

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below. Each stage should be thoroughly understood before proceeding with the next.

Stage 1. Dismantling the breech block from the gun and replacing it, Marks I and II guns.

Stage 2. Stripping the firing mechanism and re-assembling it.

Stage 3. Stripping other parts.

Stage 4. Changing the firing pin.

Stage 5. Removing the gun from the mounting and replacing it.

4. THE MECHANISM, MARKS I AND II GUNS

1. General remarks.

The mechanism of the guns as set out below deals with the whole cycle of operations, and is divided into stages to simplify instruction.

2. The mechanism.

i. *To load* (Mark I gun).

Place a round into the chamber and close the breech by pressing the B.M.L. down as far as it will go.

During the first part of its movement, the lever pivots on its stud in the horizontal portion of the transverse groove in the rear face of the breech recess, and forces the breech block upwards into the closed position, the stud at the same time moving along the groove from right to left.

As the breech block rises, the cartridge is pressed home by the bevel on the front face of the breech block and the forward inclination of the guides and grooves. At the same time, the long arms of the extractors are carried forward into the recesses on either side of the chamber. When the lower stops of the breech block engage the metal of the gun, thus preventing further upward movement of the breech block, the stud is entering the radial surface of the groove. In the final movement of the lever the stud becomes engaged in the recess in the breech block and the radial surface of the transverse groove, so supporting the breech block in the closed position.

When the B.M.L. reaches the locked position, the upper end of the retaining catch enters the recess in the rear face of the breech block, where it is retained by the action of the spring, thus preventing accidental movement of the lever. The firing pin is now opposite the cap, ready to go forward on firing.

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Method of instruction.

To prepare the gun.—Open the breech.
Demonstration.—Load slowly with a drill cartridge.
Explanation.—

(*a*) Cartridge placed in chamber.
(*b*) Movement of B.M.L.
(*c*) Stud of B.M.L. in horizontal portion of the transverse groove.
(*d*) Bevel on face of breech block and forward inclinations of the guides and grooves.
(*e*) Round being forced into chamber.
(*f*) Long arm of the extractors.
(*g*) Stops on breech block.
(*h*) Stud engaged in recess in breech block and radial portion of transverse groove.
(*i*) Retaining catch.
(*j*) Position of firing pin.

Interrogation.

ii. *To fire* (Mark I gun).

With the change-lever set at 3-pr., depress the safety catch and squeeze the firing trigger; the action of the latter causes the firing and actuating lever, which is engaged with the striking rod, to force the rod outwards against the upper end of the operating lever. The operating lever being pivoted in the centre, causes the forked end, which is engaged with the actuating sleeve, to move the actuating sleeve to the left. The upper end of the rocking lever, being engaged with the lever actuating main shaft, causes the shaft to rotate; the firing lever of the extension shaft being engaged with the firing lever on the mounting, causes the latter to rotate, forcing the firing bar and upper arm of the trigger sear inwards, compressing the springs of the firing lever plunger and trigger sear actuating plunger respectively. This action revolves the trigger sear on its axis pin, until the cocking toe on its lower arm is moved clear of the cocking sleeve, when the firing pin, actuated by the mainspring, is carried forward on to the cap.

During recoil the firing lever plunger presses the firing lever and firing bar to their normal positions, allowing the actuating plunger to revolve the trigger sear in the opposite direction, until the projection on its inner arm enters the lower recess of the sleeve.

When pressure on the firing trigger is released, the firing lever shaft tension spring returns the firing gear to the ready position.

On firing.—The explosion of the charge causes a heavy pressure in the cartridge case, expanding it radially against

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the chamber, thus preventing any escape of gas back past the outside of the case to the rear, internal escape of gas through the primer is prevented by the gas sealing arrangements in the primer.

The cartridge case thus forms the means of obturation.

Method of instruction.

To prepare the gun.—Load with a drill cartridge.
Demonstration.—Fire the gun.

Explanation.—

(*a*) Safety catch disengaged and firing trigger squeezed.
(*b*) Operating lever moving actuating sleeve to the left.
(*c*) Movement of rocking lever.
(*d*) Lever actuating mainshaft.
(*e*) Firing bar acting on upper arm of trigger sear.
(*f*) Compression of the springs of the firing lever and trigger sear plungers.
(*g*) Cocking toe of sear disengaged from cocking sleeve. Action of mainspring.
(*h*) On recoil, firing bar and trigger sear springs return bar and sear.
(*i*) Projection on sear engages in recess in sleeve.
(*j*) Firing gear returned to ready position, when pressure is released from the firing trigger.
(*k*) Obturation.

Interrogation.

iii. *Action of the change-over mechanism* (Marks I and II guns).

(*a*) 3-pr.—when the change-lever is moved to 3-pr. the forked clutch forces the selecting sleeve to the rear, causing the dogs on the selecting sleeve to become engaged with the dogs on the firing lever extension shaft. When pressure is applied to the firing handle the main firing lever shaft is caused to rotate, the selecting sleeve fitted on the rear end of the main firing lever shaft also rotates, and being in engagement with the firing lever extension shaft causes the firing lever to move upwards, thus firing the 3-pr. gun. During this movement the firing lever shaft spring is placed under tension, due to the rotation of the main firing lever shaft.

(*b*) Co-ax.—when the change-lever is moved to co-ax. the forked clutch forces the selecting sleeve forward, disengaging the sleeve from the firing lever extension shaft and causing the dogs on the selecting

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sleeve to engage with the dogs of the lever actuating rod of the co-axial firing mechanism.

When pressure is applied to the firing handle, the selecting sleeve is rotated through the medium of the main firing lever shaft as described above. The sleeve, being engaged with the actuating lever of the co-axial firing mechanism, causes the lever to rotate anti-clockwise, thus firing the co-axial gun.

Method of instruction.

To prepare the gun.

(*a*) Description of parts.
(*b*) Firing mechanism of 3-pr. and co-ax. cocked.

Demonstration and explanation.

(*a*) 3-pr.—
(1) Change-lever moved to 3-pr.
(2) Forked clutch moving the selecting sleeve.
(3) Engagement of sleeve with the firing lever extension shaft.
(4) Pressure applied to firing trigger; rotation of main firing lever shaft.
(5) Gun fired.
(6) Main firing lever shaft spring under compression.

(*b*) Co-ax.—
(1) Change-lever moved to co-ax.
(2) Selecting sleeve moved into engagement with the lever actuating rod of the co-ax. firing mechanism.
(3) Pressure applied to firing trigger.
(4) Lever, actuating rod, operating the rods and levers of the co-ax. firing gear.
(5) Gun fired.

Interrogation.

iv. *To unload* (Mark I gun).

As the B.M.L. revolves the cams on its rear face press against the cocking cam, and force the latter, together with the cocking sleeve and striker to the rear, thus withdrawing the firing pin from the cap before the breech block commences to move; no movement of the breech block is possible, because the stud on the B.M.L. is moving in the radial portion of the transverse groove.

As soon as the stud enters the horizontal portion of the groove the breech starts to open. As the breech block descends, it moves slightly to the rear due to the inclinations of the guides and grooves.

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The inclined stops bear against the actuating arms of the extractors, forcing them downwards, thus moving the long arms to the rear and ejecting the empty case.

Method of instruction.

To prepare the gun.—Load the gun with a drill cartridge and release the firing mechanism.

Demonstration.—Unload slowly so that each movement can be seen.

Explanation.—

(*a*) Rotation of B.M.L.
(*b*) Firing pin withdrawn from the cap before the breech block begins to move.
(*c*) Stud in horizontal portion of transverse groove.
(*d*) Breech block descending.
(*e*) Empty case ejected.

Interrogation.

v. *Cocking action* (Mark I gun).

As the B.M.L. revolves, the cams on its rear face press against the cams on the cocking cam and force the latter with the cocking sleeve, spindle striker and firing pin to the rear.

As the movement of the B.M.L. and cocking sleeve continues, the cocking toe on the lower arm of the trigger sear moves from the lower to the upper end of the recess, revolving the trigger sear on its axis pin against the actuating plunger, compressing its spring. During the further movement of the cocking sleeve to the rear, the cocking toe of the sear overrides the metal of the sleeve until it clears the front edge, when the actuating plunger revolves the trigger sear in the opposite direction, causing the cocking toe to pass in front of the sleeve. The sleeve continues its backward movement until the cocking cam is supported on the cams on the rear face of the B.M.L.

The mainspring is now compressed between the bottom of its recess in the pintle of the B.M.L. and the head of the striker spindle.

As the breech is closed, the cocking cam leaves the cam on the rear face of the B.M.L. and moves slightly forward until the cocking sleeve meets the cocking toe on the trigger sear.

Method of instruction.

To prepare the gun.—Breech closed, firing mechanism eased.

Demonstration.—

(*a*) Open and close the breech slowly.

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(*b*) Remove the breech block from the gun. Strip down and assemble the spindle striker, cocking cam, cocking sleeve and cocking handle, show how they all move as one and are prevented from rotating.

Explain how cocking toe on trigger sear engages with the cocking sleeve.

(*c*) Re-assemble the breech block with the extractor hinge bolt collar in place of the cocking sleeve, and replace B.B. in gun.

(*d*) Open and close the breech slowly.

Explanation.—

(*a*) B.M.L. rotating.

(*b*) Cocking cam, spindle striker, cocking sleeve and cocking handle forced to the rear.

(*c*) Operation of the trigger sear.

(*d*) Cocking cam held to the rear.

(*e*) Compression of mainspring.

(*f*) Breech closing, cocking sleeve engaging with the cocking toe of the trigger sear.

Interrogation.

vi. *Missfire* (Marks I and II guns).

When a missfire occurs, the firing mechanism will be recocked without opening the breech, by pulling the cocking handle to the rear with the cocking lanyard, until the firing mechanism is cocked.

Method of instruction.

This lesson will be conducted in the form of interrogation.

vii. *Action on firing of the hydraulic buffer cylinder and recuperator* (Marks I and II guns).

(*a*) *Backward movement.*

Assuming that a round has been fired the action of recoil forces the gun to the rear; attached to the gun by the gun lug nut, for Mark I, or by the securing nut, for the Mark II gun, is the buffer cylinder, which moves to the rear with the gun, the length of recoil being 10·5 inches.

The piston during this movement is stationary. The front end of the piston is secured to the piston cap, and the latter being screwed on to the front of the mounting cannot move.

The backward movement of the gun is controlled by the liquid in the cylinder. The liquid, by the action of the cylinder, is forced against the piston head and escapes through the three grooves cut in the front cylinder. At the commencement the

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grooves are deep, so during the early part of the backward movement the oil escapes quickly, but as the grooves diminish in depth less oil can escape, thus slowing down the recoil of the gun. A point is reached when no more oil can escape, the oil remaining is trapped between the front face of the piston head and the stuffing box, thus bringing the gun to rest in its full recoil position.

During this movement the running out springs are compressed between two seatings; the front end of the spring is positioned behind the front end of the buffer cylinder, and the rear end of the spring is bearing against the mounting, with the result, that on recoil, the spring is compressed from the front on to its stationary seating.

Method of instruction.

Method of instruction.

To prepare the gun.—

(1) Brief description of parts.
(2) Wooden model of buffer, diagrams and stripped buffer, if available.

Demonstration.—Using the wooden model, demonstrate the backward movement.

Explanation.—

(1) Action of recoil forcing the gun to the rear.
(2) Buffer cylinder—how connected to gun.
(3) Length of recoil.
(4) Piston held stationary.
(5) Liquid forced through the three grooves.
(6) Further escape of oil prevented.
(7) Gun in full recoil position.
(8) Compression of springs.

Interrogation.—The instructor will, by explanation and interrogation, bring out any faults that are likely to occur in the recoil system.

(*b*) *Forward movement.*

The force of the explosion being expended, the running out springs assert themselves and force the buffer cylinder and gun forward into the run-out position and retain the gun there.

During the first part of this forward movement there is practically no control over the gun; therefore this movement is sharp until the control chamber (which on the recoil of the gun has been filled with liquid) passes over the control plunger;

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resistance is then set up, so controlling the forward movement. The liquid in the control chamber is forced through the hole in the rear end, this being regulated by the adjustment of the needle valve. The liquid displaced during this action, passes through the grooves on the outside of the control chamber, and part of it flows back into the front cylinder.

Method of instruction.

To prepare the gun.—As for the backward movement.

Demonstration.—Using the wooden model, demonstrate the forward movement.

Explanation.

(1) Springs forcing buffer cylinder and gun forward.
(2) Control chamber passing over control plunger, control of run-out.
(3) Liquid returning to front cylinder.

Interrogation.—The instructor will, by explanation and interrogation, bring out any faults that are likely to occur in the recoil system.

(*c*) *Common faults in the recoil system.*

The following are the more common faults likely to be experienced, with their likely causes and appropriate remedies :—

Fault (1)	Cause (2)	Remedy (3)
1. Recoil violent.	1. i. Air in the cylinder. ii. Partly empty buffer. iii. Weak or broken springs.	1. i. Open snifting valve, or filling plug. ii. Fill buffer. iii. Replace.
2. Recoil excessive.	2. i. Worn piston. ii. Buffer nearly empty.	2. i. Replace. ii. Fill buffer.
3. Recoil short.	3. i. Damaged guides. ii. Tight packings.	3. i. Repair. ii. Repack.
4. Run-out slow.	4. i. Air in buffer. ii. Burrs or grit on guides. iii. Weak or broken springs. iv. Tight packings. v. Needle valve adjusted too tightly.	4. i. Open snifting valve or filling plug. ii. Remove. iii. Replace. iv. Repack. v. Adjust.

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Fault (1)	Cause (2)	Remedy (3)
5. Failure to run-out.	5. i. Burrs or grit on guides. ii. Weak or broken springs. iii. Tight packings.	5. i. Remove. ii. Replace. iii. Repack.
6. Violent run-out.	6. i. Buffer nearly empty. ii. Incorrect adjustment of needle valve.	6. i. Fill buffer. ii. Adjust.

viii. *Safety arrangements* (Mark I guns).

The gun cannot be fired before the breech block is fully home for the following reasons :—

(*a*) The firing pin is not in line with the cap.
(*b*) The firing bar cannot act on the trigger sear.
(*c*) The firing pin is prevented from reaching the fully fired position owing to the cams on the cocking cam fouling the cams on the B.M.L. in moving forward, and to the pintle of the lever not being in the fully forward position.

Method of instruction.

To prepare the gun.—Load the gun with a drill cartridge, breech not fully closed.

Demonstration.—Attempt to fire the gun.

Explanation. } The above points should be elicited as
Interrogation. } far as possible by interrogation.

ix. *To load* (Mark II gun).

The cartridge is inserted into the breech opening, and placed into the chamber with a sharp movement, its rim carrying the extractor levers to the front, so withdrawing their hooks from the recesses in the breech block. When the hooks are clear, the actuating shaft is placed under control of the breech closing spring, which pushes the rack outwards, revolving the rack pinion, actuating shaft and crank. The side movement of the crank carries the breech block to the locking position, and the inclined plane on the front face, in conjunction with the forward inclination of the guides and grooves, presses the cartridge home into the chamber.

The closing stops on the breech block engage the metal of the gun, thus preventing further movement of the breech block.

The crank is then seated on the inclined surface of the breech block, and prevents accidental opening.

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Method of instruction.

To prepare the gun.—Open the breech, return the B.M.L. and insert the tommy in the actuating shaft.

Demonstration.—

(*a*) Load with a drill cartridge, controlling the movement with tommy.

(*b*) Remove the breech block; strip down; insert the dummy breech block, with bottom extractor, into the breech recess. Fit the crank to dummy breech block.

Replace B.M.L., rack pinion and actuating shaft Open the breech.

(*c*) Load the gun with a drill cartridge, controlling the movement with the tommy.

Explanation.—

(*a*) Cartridge placed in chamber.

(*b*) Extractor levers carried forward, hooks disengaged from recesses in breech block.

(*c*) Breech closing spring acting on rack, rack pinion, actuating shaft and crank. Breech closed.

(*d*) Round forced home.

(*e*) Closing stops engaging metal of gun.

(*f*) Accidental opening of breech block prevented by the crank.

Interrogation.

x. *To fire* (Mark II gun).

With the change lever set at 3-pr., depress the safety catch on the firing handle and squeeze the firing trigger. The action of the latter causes the firing rod actuating lever, which is engaged with the striking rod, to force the rod outwards against the upper end of the operating lever. The operating lever, being pivoted in the centre, causes the forked end, which is engaged with the actuating sleeve, to move the actuating sleeve and the forked end of the rocking lever to the left. The upper end of the rocking lever, being engaged with the lever actuating main shaft, causes the latter to rotate; the firing lever of the extension shaft, being engaged with the outer arm of the firing lever on the gun, forces the latter upwards, compressing its spring and plunger. The inner arm of the firing lever goes down and presses the right arm of the trigger sear down into the trigger recess, also against its spring and plunger. The cocking toe of the trigger sear moves clear of the cocking sleeve, allowing the sleeve, spindle striker and firing pin to move forward under the action of the mainspring on to the cap so exploding the charge.

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On recoil, the gun moves clear of the firing lever of the extension shaft, and the firing lever of the gun is moved clear of the trigger sear by its plunger and spring.

When pressure on the firing trigger is released, the main firing lever shaft tension spring returns the firing gear to the ready position.

On firing—the explosion of the charge causes a heavy pressure in the cartridge case, expanding it radially against the chamber, thus preventing any escape of gas back past the outside of the case to the rear; internal escape of gas through the primer is prevented by the gas sealing arrangements in the primer.

The cartridge case thus forms the means of obturation.

Method of instruction.

To prepare the gun—Load with a drill cartridge.

Demonstration.—Fire the gun.

Explanation.—

(*a*) Safety catch disengaged and firing trigger squeezed.
(*b*) Operating lever moving actuating sleeve to the left.
(*c*) Movement of rocking lever.
(*d*) Lever actuating mainshaft.
(*e*) Firing lever on gun, acting on outer arm of trigger sear.
(*f*) Compression of the firing lever spring and plunger.
(*g*) Cocking toe of sear disengaged from cocking sleeve. Action of the mainspring.
(*h*) On recoil, firing lever moved clear of the trigger sear.
(*i*) Firing gear returned to the ready position when pressure is released from the firing trigger.
(*j*) Obturation.

Interrogation.

xi. *Action of the " change-over " mechanism* (Mark II gun). See Sec. **4**, 2, iii.

xii. *To unload* (Mark II gun).

The gun having been fired, as it returns to the run-out position the actuating cam on the lower end of the actuating shaft strikes against the operating lever on the cradle, causing the shaft to rotate. The rack pinion and crank, being splined to the actuating shaft, rotate with it; the rack pinion, being engaged with the rack, forces the latter to the left, compressing the breech closing spring.

The head of the crank moves from left to right in the wide portion of the slot in the breech block during which time it is not touching the metal of the breech block. The cocking link is pushed to the rear by the cocking link actuating pin moving from one end of its elongated slot to the other; the link,

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being in contact with the right arm of the cocking sleeve, causes the sleeve to withdraw the firing pin from the base of the round before the breech block commences to move.

The head of the crank then bears against the right side of its slot and moves the breech block to the right and slightly to the rear. The lugs on the extractors, actuated by the steps in the breech block, cause the extractor levers to come to the rear and eject the empty case clear of the gun. During this movement the breech block is prevented from going too far to the right by the stops on the crank bearing against the recess on the right side of the breech recess. The hooks on the extractors become engaged with the recesses in the breech block and retain it in the open position. The firing mechanism is cocked.

The above action having been completed, the disengaging plate bearing on the inclined surface of the operating lever depresses the latter clear of the actuating cam on the actuating shaft, thus allowing the gun to run-out.

Method of instruction.

To prepare the gun.—Slacken off the breech closing spring, load the gun with a drill cartridge, and ease the firing mechanism. Insert the tommy in the actuating shaft.

Demonstration.—

(*a*) Give a slow demonstration of unloading by rotating the actuating shaft with the tommy.

(*b*) Remove the breech block, strip down : assemble the cocking link and crank by means of the cocking link actuating pin, insert the dummy breech block, with bottom extractor, into breech recess. Fit the crank and cocking link to dummy breech block. Replace B.M.L., rack pinion, actuating shaft and actuating cam; load with a drill cartridge Demonstrate slowly, controlling the movement with the tommy.

Explanation.—

(*a*) Gun running out.
(*b*) Actuating cam striking the operating lever.
(*c*) Rotation of actuating shaft, crank and rack pinion.
(*d*) Breech closing spring compressed.
(*e*) Firing pin withdrawn from base of round before the breech block commences to move.
(*f*) Breech block moving to the right.
(*g*) Empty case ejected.
(*h*) Breech block prevented from moving too far to the right.

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(*i*) Hooks on extractor levers, engaging in recesses in the breech block, holding breech block in open position.

(*j*) Action of disengaging plate.

Interrogation.

xiii. *Cocking action* (Mark II gun).

As the crank rotates, the cocking link actuating pin pushes the cocking link to the rear. The backward motion of the link presses the cocking sleeve, spindle striker and firing pin to the rear, compressing the mainspring; when the left arm of the cocking sleeve is clear of the trigger sear, the latter, under the action of its spring, is rotated, the cocking toe of the sear passing in front of the left arm of the cocking sleeve. The final forward motion of the link leaves the sleeve and spindle striker supported in the cocked position by the cocking toe of the trigger sear.

Method of instruction.

To prepare the gun.—With the breech block closed and the firing mechanism eased, slacken off the breech closing spring. Insert tommy in the actuating shaft.

Demonstration.—Open the breech slowly.

Explanation.—

(*a*) Remove the striker case and take out the mainspring. The action of the cocking link may now be shown by gently pushing the cocking sleeve back with the fingers.

(*b*) Crank rotating.

(*c*) Cocking link, cocking sleeve and spindle striker being forced back.

(*d*) Compression of mainspring.

(*e*) Cocking toe of trigger sear passing in front of left arm of sleeve.

(*f*) Sleeve held by the cocking toe of the sear.

Interrogation.

xiv. *Missfires* (Mark II gun).

See Sec. **4**, 2, vi.

xv. *Action on firing of the hydraulic buffer cylinder and recuperator* (Mark II gun).

See Sec. **4**, 2, vii.

xvi. *Safety arrangements* (Mark II gun).

The gun cannot be fired before the breech block is fully home for the following reasons :—

(*a*) The sear recess in the block is not in line with the firing lever toe.

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(*b*) The cocking link is projecting beyond the rear face of the breech block, therefore the cocking sleeve would foul the link before the firing pin could go right forward.

(*c*) The firing pin is not in line with the cap.

Method of instruction.

To prepare the gun.—Load the gun with a drill cartridge, breech not fully closed.

Demonstration.—Attempt to fire the gun.
Explanation. } The above points should be elicited, as
Interrogation. } far as possible, by interrogation.

3. Method of instruction.

i. *Object.*

To give the student such a knowledge of the mechanical action of the gun, that, should a stoppage occur, he will be able to diagnose the cause and supply the remedy, and be confident in his ability to handle the weapon.

ii. *Equipment required.*

(*a*) Gun mounted in a tank or suitable pedestal.
(*b*) Drill cartridge.
(*c*) Wooden model of buffer.
(*d*) Stripped buffer (if available).
(*e*) Diagrams.
(*f*) Set of tools.
(*g*) Demonstration dummy breech block (Mark II gun).

iii. *Sequence of instruction.*

The following is the sequence in which instruction in mechanism will be given. Each stage should be thoroughly understood before proceeding to the next. The method of instruction is set out for each stage :—

(*a*) To load.
(*b*) To fire.
(*c*) Action of the change-over mechanism.
(*d*) To unload.
(*e*) (1) Cocking action.
(2) Missfire.
(*f*) Action on firing of the hydraulic buffer cylinder and recuperator.
(1) Backward movement.
(2) Forward movement.
(3) Common faults in the recoil system.
(*g*) Safety arrangements.

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5. CAUSES OF FAILURE

1. General.

Causes of failure may be divided into two sections, viz. :—

i. Mechanical.
ii. Ammunition.

NOTE.—In the event of a fault occurring in the ammunition, a report will always be rendered.

2. Mechanical failures and possible cause.

FAILURE	POSSIBLE CAUSE
i. Gun firing without pressing the firing trigger (Mark I only).	i. Weak trigger sear spring.
ii. Gun not firing when the finger trigger is squeezed.	ii. (*a*) Change lever not at 3-pr. (*b*) Firing gear out of adjustment. (*c*) Bent or distorted firing levers. (*d*) Gun not run-out.
iii. Missfire.	iii. (*a*) Worn or broken firing pin. (*b*) Weak or broken mainspring.
iv. Inaccurate shooting due to gun, mounting and sights.	iv. (*a*) Sights not adjusted correctly. (*b*) Excessive wear in the bore, trunnions and sight bracket. (*c*) Faulty telescope. (*d*) Bore fouled. (*e*) Blowbacks caused by wear in the chamber.

3. Ammunition failures and possible cause.

FAILURE	POSSIBLE CAUSE
i. Missfire.	i. (*a*) Sunken cap. (*b*) Deteriorated cap composition. (*c*) Copper sealing ball stuck. (*d*) Deteriorated gunpowder in primer. (*e*) Deteriorated cordite.
ii. Hangfire.	ii. (*a*) Moist gunpowder in primer. (*b*) Faulty cap composition.

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Failure	Possible Cause
iii. Prematures.	iii. (*a*) Propellant gases entering into interior of fuze or shell. (*b*) Obstructions in the bore. (*c*) Weak or deficient creep spring in fuze. (*d*) Faulty pellet. (*e*) H.E. shells, when old, not properly sealed.
iv. Unexploded shell.	iv. (*a*) Faulty fuze. (*b*) Deteriorated intermediary or filling. (*c*) Badly sealed shell causing set-back of the adapter or fuze, or air gaps.
v. Partially exploded shell.	v. (*a*) Deteriorated exploder or filling. (*b*) Badly sealed shell causing set back of the adaptor or fuze, or air gaps.
vi. Inaccurate shooting due to faulty ammunition.	vi. (*a*) Loose or stripped driving bands. (*b*) Weak or excessive charge. (*c*) Blow backs caused by split cases, or primers not screwed home.

Note.—When compiling reports on ammunition, particulars relating to :—

i. Primer	will be found on the base of the primer.
ii. Propellant	are stencilled on side of cartridge case.
iii. Cartridge case	are stamped on base of cartridge case.
iv. Fuze	on base of fuze.
v. Filling of shell ...	is denoted by colour of the projectile and stencilling.

4. Method of instruction.

i. This lesson will, as far as possible, be conducted in the form of interrogation.

ii. A gunner should, when circumstances permit, endeavour to rectify a mechanical defect in order to keep the gun in action.

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6. MAINTENANCE—GUNNERY

1. Object.

Maintenance gunnery includes care, cleaning, lubrication and adjustments, and will be taught so as to ensure :—

i. Maximum mechanical efficiency.
ii. That unnecessary work is obviated.

2. Responsibility.

Officers commanding units are responsible for the condition of the guns on their charge, and for instruction of their men in maintenance. Great care must be exercised in the handling of the guns in order to avoid damage to the various parts.

3. Materials supplied for cleaning.

Oil, rangoon	For general lubrication and cleaning.
Mineral jelly	For preserving metal when weapons are in storage for long periods.
Grease	Lubricating.
Oil, mineral, hydraulic buffer.	
Old linen	For general cleaning.
Paint	As required.
Bath brick	Removing rust (artificers' use only).
Sponge cloth	For cleaning purposes.

4. Special remarks.

i. *For guns in store.*

When guns are to be stored for long periods, they will be dry cleaned and all metal surfaces coated with mineral jelly. When taken out of store, care must be taken to remove the grease from all corners and holes, such as lubricators, etc. ; and to work oil into the bearing surfaces. Guns taken out of store will be cleaned under the supervision of an artificer.

ii. *Wear in the bore.*

This is due to two causes :—

(*a*) The friction of the driving band.
(*b*) The heat generated by the propellant charge.

iii. *High polish of the bore.*

The highly polished surface of the bore, when new, minimizes the tendency to rust and to collect metallic fouling. As the bore becomes worn the polish diminishes, and greater care is necessary to prevent the formation of rust. No means of cleaning the barrel will be employed other than that given in instructions for cleaning.

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iv. *Fouling.*

There are three kinds of fouling :—

(*a*) Superficial.—The waste products of the propellant charge remaining on the surface of the bore.

(*b*) Internal.—Caused by some of the products of combustion being forced into the pores of the metal.

(*c*) Metallic.—Caused by portions of the driving band being left on the surface of the bore, appearing as copper-coloured streaks in the grooves or on the lands.

The result of neglect in either of the first two cases, (*a*) and (*b*), will be the the formation of rust. The drastic treatment required to remove the rust causes unnecessary wear.

Internal fouling is present in any barrel through which rounds have been fired, and is not immediately discernible. This fouling, in the course of time, will eventually be forced from the pores of the metal and form a hard black crust of fouling on the surface of the barrel.

The majority of internal fouling can be removed after firing by the use of boiling water.

If circumstances do not permit the use of boiling water, the barrel must be repeatedly dry-cleaned and re-oiled. This method will eventually remove the fouling and prevents it from forming on the surface of the bore.

Superficial fouling, if allowed to remain long in the barrel, will become hard and have an effect similar to that produced by internal fouling.

The bore should be examined for traces of metallic fouling. This is removed by a special process ; this will only be carried out by an artificer.

v. *Sandy countries.*

Great care is necessary in the quantity of oil used. A thin film of oil, i.e. parts wiped over with an oily rag, will prevent rust from forming and also be sufficient lubricant for the gun when firing.

vi. *In frosty weather.*

Oil the mechanism very slightly. For precautions relating to the recoil system, see 3-Pr. Handbook, pages 71–75 and 123–132.

vii. *Telescopes.*

The telescope, when issued, is in the correct adjustment, watertight and with all its cells secured by fixing screws. On no account must it be taken apart, except by a person holding a certificate from the Military College of Science stating that he is competent to do so.

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Telescopes must be kept free from oil and the lenses cleaned with clean, soft linen kept specially for the purpose. When not in use, the telescope will be stored in a dry, dustproof place with the covers on.

viii. *Precautions to be taken against gas.*

Keep all metal surfaces well oiled. After being exposed to gas, the gun should be cleaned by wiping the affected parts with waste soaked in paraffin or petrol. Final swabbing with clean soaked waste should then be carried out, the swabs being finally burnt. Re-oil the gun.

All traces of gas must be removed from the ammunition by wiping with a slightly oiled rag, and then thoroughly dry cleaning.

ix. When firing blank, the bore must first be coated with a thin film of oil.

x. Turrets should be turned and left in a different position each day.

5. Lubrication.

For full particulars of the "Table of lubrication" and "Lubrication charts," see 3-Pr. Handbook, pages 121–123, and Plates 19 and 20.

6. Recoil system—maintenance.

i. The maintenance of the recoil system is normally carried out by an artificer; in emergency, however, it may be necessary for crews to perform these duties. Gunners, therefore, should receive instruction to enable them to deal with an emergency when the services of an artificer are not available. When necessary an artificer should assist in teaching this lesson.

ii. The efficient working of the recoil system depends chiefly upon the following:—

(*a*) Correct filling of buffer and strength of springs.
(*b*) The packings.
(*c*) Careful observation of the recoil system, both in and out of action. The probable causes of failure and their remedies are given in Sec. **4**, vii (*c*).

iii. The following points should be explained by the instructor and when possible the operations should be carried out practically by every gunner under instruction.

(*a*) Filling the buffer.
(*b*) Tests for the recoil system.
(*c*) Stripping and assembly of the buffer.*
(*d*) Tightening of glands.*

(3-Pr. Handbook, pages 71–75 and 123–132.)

* These duties will be carried out only by an artificer.

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7. To clean the barrel.

i. *Immediately after firing.*—

Thoroughly oil the bore and chamber.

NOTE.—The oil brush, if used for this purpose, must be thoroughly cleaned after use.

ii. *Cleaning after firing.*

As soon as possible, on return to billets, all fouling must be removed. An effective method of cleaning is the use of boiling water. Thoroughly dry clean the barrel and chamber with dry rag in the following manner—reverse the cleaning rod and wrap a piece of dry, clean rag round the end so that it will fit tightly in the bore. With the breech open, force the rag and cleaning rod through the bore from the chamber end. Place an empty case in the chamber and close the breech. Traverse the gun to a position where members of the crew can use the water brush from the muzzle. Elevate the gun and partially fill the barrel with *boiling* water. Insert the water brush from the front end and thoroughly scour out the bore. As the boiling water becomes dirty, replace with clean, until such time as the fouling has been removed (the colour of the water used in the bore will probably indicate this). Drain off the water by depressing the gun. Remove the empty case from the chamber and thoroughly clean the latter.

The barrel and chamber will then be dry cleaned and examined (by an artificer, if available) for fouling in the lands and grooves. The barrel and chamber, at the conclusion of the examination, will be re-oiled immediately.

NOTE.—The breech block will be removed from the gun; stripped, dry cleaned and scoured with boiling water, paying particular attention to the face of the breech block. Thoroughly dry clean and re-oil.

iii. *Subsequent care after firing.*

When the gun has been fired, daily cleaning of the bore is necessary for at least ten days after firing, and every precaution should be taken to prevent the formation of rust. Subsequent cleaning beyond this period depends on atmospheric conditions, and therefore, must be left to the discretion of the officer in charge. The bore at all times must be left coated with oil.

8. Daily cleaning.

i. *Gun.*

Remove the breech block from the gun, strip down and dry clean. Dry clean and examine the chamber and barrel.

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Re-oil breech block and bore, clean and oil all bright surfaces: clean all gunmetal and painted parts.

If circumstances do not permit the removal of the breech block, wipe over with an oily rag.

ii. *Mounting.*

(*a*) Clean and oil where necessary.
(*b*) Examine the buffer for leakage.
(*c*) Wipe over the gears with an oily rag.
(*d*) Clean and oil all bright surfaces: clean all gunmetal and painted parts.

iii. *Sights.*

Normally be in store.

iv. *Spare parts and tools.*

Clean and re-oil.

9. Preparation for weekly inspection.

A thorough cleaning and overhaul will take place weekly, coinciding with an inspection. The method of laying out the parts will be in accordance with unit instructions, and the condition of the parts will be as laid down in para. 14 below.

After the inspection and weekly cleaning, parts will be restored to their normal state as described in the table.

10. Cleaning after firing.

As soon after firing as possible, the gun, mounting, sights, spare parts and ammunition will be returned to their normal state. For full particulars, see points before, during and after firing.

11. Preparation for inspection by an artificer.

The gun will be prepared as for weekly inspection, with the following additions:—

i. The covers of the elevating and traversing gears, and spring cap case will be removed.

ii. At least three men of the crew will be present to assist the artificer.

12. Quarterly inspection.

If possible, this inspection should coincide with an artificer's inspection; on service or during practice camp additional inspections are desirable.

i. Remove the gun from the mounting.

ii. Thoroughly dry clean the cradle and gun.

iii. Ensure that all lubricators, oil holes and oil pipes are clear.

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iv. Clean the recoil guides, and guide ways with paraffin, dry clean and re-oil.

v. Recoil system examined.

13. Care of ammunition.

i. The air-tight ammunition boxes should not be opened unnecessarily.

ii. The shells, if stacked loose, must be laid on their sides.

iii. Ammunition will be examined for the following defects :—

(*a*) Damaged driving bands.
(*b*) Damaged cases.
(*c*) Loose primers.
(*d*) Verdigris on case. (Remove with turpentine.)
(*e*) Dirt on cases or projectiles.
(*f*) Damaged nose caps on practice shells.
(*g*) Ensure that cartridge clips are fitted to each round.

iv. Ammunition must always be handled with care.

14. Method of instruction.

i. *Object.*

ii. *Responsibility.*

iii. *Equipment required :—*

(*a*) Gun correctly mounted in a tank or suitable pedestal.
(*b*) Rods, for brush, sponge, 3-pr.
(*c*) Brushes, sponge 3-pr. (one for water, one for oil).
(*d*) Empty 3-pr. case.
(*e*) Cleaning materials as necessary.
(*f*) Set of tools (as for stripping).

iv. *Sequence of instruction.*

For instructional purposes, maintenance-gunnery will be taught in stages, as set out below :—

(*a*) Special remarks.
(*b*) Lubrication.
(*c*) Recoil system maintenance.
(*d*) To clean the barrel.
(*e*) Daily cleaning.
(*f*) Preparation for weekly inspection.
(*g*) Cleaning after firing.
(*h*) Preparation for inspection by an artificer.
(*i*) Quarterly inspection.
(*j*) Care of ammunition.

Demonstration and explanation are best combined in teaching these stages, each stage being thoroughly mastered before proceeding to the next.

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NOTE.—The following sequence will be adhered to :—

(1) Gun.
(2) Mounting.
(3) Sights.
(4) Spare parts and tools.
(5) Ammunition.

All lessons will be of a practical nature, and will be carried out in conjunction with "Points before, during and after firing," and "Repairs and adjustments," see "Method of Instruction," Secs. **7** and **8**.

v. The following table is a guide to the condition of the gun, mounting, sights, spare parts and tools, on the occasions mentioned.

Part of weapon (1)	Prepared for firing (2)	Immediately after firing (3)	Normal state (4)	Prepared for inspection (5)	Storage for long periods (6)
Bore.	Dry cleaned.	Oiled.	Oiled.	Dry cleaned.	Coated with mineral jelly.
Working parts of gun and mounting.	Oiled.	Oiled.	Oiled.	Dry cleaned.	Coated with mineral jelly.
Exterior of barrel.	Oiled.	Oiled.	Oiled.	Dry cleaned.	Coated with mineral jelly.
Bright or browned surfaces.	Slightly oiled.	Oiled	Oiled.	Dry cleaned.	Coated with mineral jelly.
Muzzle covers.	Off.	On.	On.	Off.	As ordered.
Telescopes.	Fitted.	Fitted.	In stores.	Fitted.	In stores.
Spare parts.	Slightly oiled.	Slightly oiled.	Oiled.	Dry cleaned.	Coated with mineral jelly.

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7. POINTS TO BE ATTENDED TO BEFORE, DURING AND AFTER FIRING

1. Object.

To ensure that all the points upon which the mechanical efficiency of the gun in action depends are attended to in a logical sequence so that none are omitted.

2. Points before firing.

i. *Preparation of armament.*

(*a*) *Gun.*

(1) Bore, clean and dry.
(2) Strip, clean and examine breech mechanism.
(3) Oil frictional surfaces.
(4) Assemble the breech block and test the protrusion of the striker.
(5) Replace the breech block in the gun.
(6) Breech closing spring correctly adjusted.
(7) Examine the firing mechanism, ensuring that all connections are secure.

(*b*) *Mounting.*

Buffer—(1) Examine and replenish level of oil.
(2) Snifting valve tight.
(3) Examine for leakage.
(4) Adjust run-out valve to known setting at $\frac{1}{4}$ turn.

(*c*) *Mounting and turret.*

(1) Lubricate all bearing and frictional surfaces.
(2) Lubricate the turret racer ring and tighten any screws that may be loose.
(3) Lubricate the elevating and traversing gears.
(4) Ensure that all nuts, bolts and split pins on the gun and mounting are secure.
(5) Tests :—
(i) Elevating gear to fullest extent.
(ii) Turret—by traversing completely round.
(iii) Sights.
(iv) Test and adjust the firing mechanism of the 3-pr. and co-ax. gun.
(6) Shoulder pads adjusted.
(7) Chute correctly fitted.
(8) Gun horizontal and at 12 o'clock.

(*d*) *Spare parts, tools and ammunition.*

(1) Spares examined and correctly stowed. Spare firing pins tested for correct protrusion.

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(2) Spare telescope, if carried, will be examined and tested.

(3) Dry clean the ammunition, examine and test in the gun. Replace cartridge clips so that they can easily be removed, and stow ammunition in the racks.

NOTE.—When testing ammunition in the gun the firing pin *must be removed*, and replaced after the test.

ii. *Inspection of armament.*

The details given below are a summary of the essential points that should be examined when it is necessary to "Inspect armament," whether the inspection be carried out by the gunners or by an officer or N.C.O. This inspection should be carried out after guns have been prepared for firing, i.e. before firing range practices in peace and prior to going into action in war, and its purpose is to ensure that no part of the preparation has been omitted or neglected by the gunner, and where the preparation has been followed by a long approach march or anything which might upset it, that the gun and mounting, etc., are still ready for firing.

(*a*) *Gun.*

(1) Muzzle cover removed.
(2) Bore clear.
(3) Test firing mechanism.

NOTE.—Muzzle covers will not be replaced if action is imminent.

(*b*) *Mounting.*

Buffer.—(1) Examine for leakage, replenishing if necessary.
(2) Run-out valve at correct setting.

(*c*) *Mounting and turret.*

(1) Ensure that nuts, bolts and split pins on the gun and mounting are correctly secured. Chute correctly fitted.
(2) Operating lever set at S.A.
(3) Test the elevating gear to the fullest extent.
(4) Test turret by traversing completely round.
(5) Sights.—Telescope correctly fitted, and secure; range drum working smoothly, sight set at 800 yards. Headrest and shoulder pads correctly adjusted.
(6) Ammunition.—Examine, and ensure that a supply is in readiness in the racks.

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3. Points during firing.

i. *During actual firing.*

(*a*) Recoil system.—This should be watched by the loader and any defects remedied as soon as possible, *e.g.*—
Violent recoil.
Violent run-out.
Sluggish run-out.
Leakage of oil.

(*b*) Ammunition.—Do not force rounds into the chamber.

ii. *During a temporary cessation of fire.*

(*a*) Wipe out the chamber.
(*b*) Lubricate where necessary.
(*c*) General examination of the gun and mounting.
(*d*) Remedy such faults in the recoil system as are within the scope of the crew.
(*e*) Replenish the supply of ammunition in the racks.
(*f*) Empty the chute.

4. Points to be attended to after firing.

i. *Immediately.*

(*a*) Ensure that the gun is unloaded.
(*b*) Oil the gas affected parts.
(*c*) If time permits, wipe the gun over with an oily rag.
(*d*) Replace cartridge clips where necessary.
(*e*) Empty the chute.

ii. *On return to billets.*

(*a*) Thoroughly clean gun and mounting.
(*b*) Cracks in the breech block or breech recess will be reported immediately.
(*c*) Bore and chamber to be inspected by an artificer or crew commander after cleaning.
(*d*) Mounting.—General examination of the gun, mounting and turret.
(*e*) Sights.—Wipe the telescope with a piece of clean linen, and replace the covers.
(*f*) Spare parts and tools.—Clean, check and report discrepancies.
(*g*) Ammunition.—Collect and remove empties. Examine and clean ammunition remaining in the tank. Replenish ammunition supply.

5. Method of instruction.

i. *Object.*

ii. *Sequence of instruction.*

For instructional purposes, points before, during and after firing will be taught in the stages set out below :—

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(*a*) Points before firing.
(*b*) Points during firing.
(*c*) Points after firing.

Method of instruction.

A full knowledge of the details of " Points before, during and after firing," "Maintenance-gunnery" and " Repairs and adjustments," as set out in this chapter, is necessary in order to obtain maximum efficiency and to prolong the life of the gun, mounting and accessories.

When teaching the lesson " Points before, during and after firing," each stage will be thoroughly mastered before proceeding to the next. It is essential that this lesson be carried out practically, incorporating all the points laid down in Secs. **6** and **8**, as may be necessary.

NOTE.—The following sequence will be adhered to :—

(1) Gun.
(2) Mounting.
(3) Sights.
(4) Spare parts.
(5) Ammunition.

8. REPAIRS AND ADJUSTMENTS

1. General remarks.

Maximum efficiency and the maintenance of a gun when in action depend on the gunner's ability to carry out minor repairs and adjustments. It is therefore essential that gunners should be able to carry out any of the repairs and adjustments set out below.

2. Testing and adjusting sights—3 pr. and co-ax. gun.

i. *General preparation.*

(*a*) The gun must be fitted with its own telescope. Clean the lenses. Open rain shade to fullest extent; place telescope in holder with eye-piece end as far back as possible. Secure telescope in holder, ensuring that the positioning stud is correctly fitted in the recess.
(*b*) Remove striker casing, and attach two pieces of cotton thread to the muzzle of the gun to form crosswires.
(*c*) Adjust forehead pad to suit the individual.
(*d*) Test for parallax.—Lay the crosswire of the telescope on a well defined object approximately 500

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yards from the gun, and move the head sideways and up and down. If the telescope is correctly adjusted for parallax there will be no apparent movement of the crosswires. If subject to parallax the crosswires will appear to move when the head is moved.

A telescope subject to parallax should be sent for repair.

(*e*) Set range cam to zero. This should be done by rotating the handwheel (taking off range) until the lowest point of the cam is reached. On no account should the cam be forced beyond this point, because to do so will strain the rollers by which the cam operates the sight bracket, and play between the bracket and cam will result. Where such play already exists the back-lash should be taken up by turning the handwheel in the opposite direction until the front end of the telescope begins to move downwards. The range cam should now be at zero.

(*f*) Rotate deflection drum hand wheel to zero; this should also set the deflection scale at zero.

ii. *The distant point method.*

(*a*) Select a well defined aiming mark, preferably not less than 500 yards from the gun, and align the axis of the bore on the distant aiming mark. If all the adjustments above are correct, the axis of the telescope will now be directed on the same aiming mark.

(*b*) There may, however, be vertical or lateral errors or a combination of both (*i.e.* the axis of the telescope is not directed on to the distant aiming mark). Errors will be corrected as follows :—

(1) *Vertical.*—If the error is plus or minus, turn the telescope a quarter of a turn at a time, when it may be found that at one of the four points the horizontal wire will be correctly aligned. If this fails to correct the error, the telescope must be changed. Defective telescopes should be reported immediately.

NOTE.—If turning the telescope alters the the position of the cross wires, the telescope is defective, but provided in one position the horizontal wire is correct, the telescope can be used. The correct position should be noted for future reference.

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(2) *Lateral.*—Turn the deflection drum hand wheel until the error is taken up.

NOTE.—The ideal is to adjust the sights on some point at the maximum range to be used. The error will then always be less than the distance between the axis of the bore and telescope.

(*c*) *Adjustments.*

(1) *Range drum.*—If the range drum is not reading zero, slacken the four fixing screws and turn the drum until the zero is opposite the indicator. Check the axis of the bore and telescope, to ensure that they have not been disturbed, and, if correct, tighten the fixing screws.

(2) *Deflection scale.*—Slacken the two fixing screws and move the deflection scale until the zero mark is opposite the arrow. Re-check alignment through bore and telescope, and tighten the two fixing screws.

(3) *Deflection drum.*—Slacken the four fixing screws and, while holding the milled portion of the drum, turn the skin until the zero mark is opposite the arrow. Re-check alignment through bore and telescope and tighten the screws.

N.B.—During these operations, repeated checking of the axis of the bore and telescope must be carried out to ensure that they have not been disturbed.

(*d*) *Co-axial machine gun.*

Having tested and adjusted the sights of the 3-pr. gun, proceed as follows :—

(1) Ensure that the gun is correctly mounted, and that the locking nuts of the connecting link, adjusting sleeve are tight.

(2) Remove the lock.

(3) Raise the crank handle, place an empty case or suitable object between the crank handle and check lever, thus bringing the hole in the crank into alignment with the hole in the rear cross-piece and the barrel. The connecting rod should be to the rear.

(4) Look through the top hole in the rear cross-piece. The axis of the co-ax. bore should be in the same plane as that of the 3-pr. gun.

If a vertical adjustment is necessary, slacken

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the locking nuts, securing the adjusting sleeve of the connecting link, and adjust the length of the connecting link by turning the adjusting sleeve; when correct, tighten the lock nuts. Re-check alignment with 3-pr. bore and telescope.

NOTE.—There is no lateral adjustment, and where a lateral error exists it should be noted by the gunner.

3. Testing and adjusting the firing mechanism, 3-pr. Mark II and co-ax. gun.

i. *3-pr.*

(*a*) Set the change-lever at 3-pr. There should be no upward movement of the firing lever extension shaft. This lever should be just bearing on the firing lever of the gun. If not correct, unscrew the lock-nut on the actuating sleeve of the firing mechanism, and adjust the sleeve until the firing lever on the extension shaft is just bearing on the firing lever of the gun.

(*b*) Cock the firing mechanism.

(*c*) Test to see if the gun will fire when the trigger is squeezed. If the gun will not fire, then some part of the firing mechanism has become strained, and it will be necessary to adjust the actuating sleeve by shortening it, until pressure on the firing trigger will depress the sear sufficiently to release the firing mechanism. On no account must it be shortened so far that the firing lever on the gun fouls the breech block when the breech is open.

In all cases where this adjustment is found to be necessary a report should be made so that the mechanism may be examined by an artificer.

ii. *Co-axial machine gun.*

(*a*) Test and adjust the sights of the 3-pr. and co-ax. gun.

(*b*) Test and adjust the firing mechanism of the 3-pr. gun.

(c) Move change-lever to co-ax.

If the adjustments are correct, the change over from 3-pr. to co-ax. (and vice versa) can be made without any movement of the arm operating the firing rod of the co-axial firing mechanism, and the gun will fire when the firing trigger is fully squeezed.

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If the adjustments are incorrect proceed as follows :—

(1) Loosen the lock-nut and unscrew the positioning bolt (situated on the right side of the housing of the change-over mechanism).
(2) Loosen the two lock-nuts securing the adjusting sleeve on the horizontal shaft, and slacken off the sleeve until the firing lever is just clear of the trigger.
(3) Move the change-lever to " ·303-in.," ensuring that it is correctly engaged.
(4) Screw up the positioning bolt until it bears against the operating arm. Tighten the lock-nut.
(5) Screw up the adjusting sleeve until the finger trigger of the M.G. commences to move.
(6) Screw up the adjusting sleeve three half turns.
(7) Cock the lock and test by firing.
(8) If the M.G. fires, tighten the lock nuts of the adjusting sleeve.
(9) If the M.G. does not fire—**Report.**

NOTE.—The above method of testing and adjusting the co-ax. firing mechanism applies in principle to any ·303-in. M.G. co-axially mounted with the 3-pr. gun, therefore the number of turns given to the adjusting sleeve may vary. It must be clearly understood that excessive adjustment of the sleeve may cause the M.G. to fire without pressure being applied to the firing trigger, i.e. on completion of loading, when the change-lever is moved to " ·303-in.," or it may not stop firing when pressure on the firing trigger is released.

4. To gauge the protrusion of the striker.

i. *Mark I gun.*

(*a*) Remove the breech block from the gun.
(*b*) Revolve the B.M.L. to the locked position and fire the mechanism.
(*c*) Apply the protrusion gauge to the face of the breech block. The minimum slot should foul the striker, but the maximum slot should clear it, the gauge remaining in contact with the face of the breech block during the test. Excessive protrusion can be adjusted by rubbing down the firing pin with an oil-stone ; if too short, change the firing pin.

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ii. *Mark II gun.*

(*a*) Remove the breech block from the gun.

(*b*) Replace the striker case, with striker completely assembled.

(*c*) As for Mark I gun.

5. Method of instruction.

i. *General remarks.*

ii. *Equipment required.*

(*a*) Gun correctly mounted in the vehicle, or on special mounting.

(*b*) Spare parts and tools.

(*c*) Telescope.

iii. *Method and sequence of instruction.*

For instructional purposes, repairs and adjustments will be taught in stages as set out below :—

(*a*) Testing and adjusting sights, 3-pr. and co-ax. gun.

(*b*) Testing and adjusting the firing mechanism, 3-pr., Mark II and co-ax. guns.

(*c*) To gauge the protrusion of the striker, Marks I and II guns.

Demonstration and explanation are best combined in teaching these stages, each stage being thoroughly mastered before proceeding to the next. All lessons will be of a practical nature and will be carried out in conjunction with " Points before firing " and " Maintenance-gunnery," Secs. **6** and **7**.

9. GENERAL HANDLING BY THE GUNNER AND LOADER

1. To load—Marks I and II guns.

i. Open the breech by rotating the B.M.L. sharply with the right hand (and return the B.M.L. to the closed position—Mark II only).

ii. Mark I.—Load the gun by placing the round into the chamber with the left hand, assisted by the right hand, until the rim of the cartridge comes into contact with the lips of the extractors. Close the breech with the right hand.

iii. Mark II.—Load the gun by placing the round into the chamber as far as it will go with the left hand, transfer the right to the base of the round and give it a smooth sweep forward with the right hand, carrying the hand over the breech in one motion.

iv. When the breech is closed on completion of loading, the loader will tap the gunlayer on the forearm.

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v. The loader will obtain another round, and stand by holding the deflector arm with the right hand and the round in the left hand.

NOTE.—It is not necessary for the loader to open the breech of the Mark II gun for subsequent rounds if the operating lever is at S.A.

2. Firing position of gunner and loader.

i. *Gunner*

Feet in most suitable position for preserving balance (right leg forward and left leg to the rear). Left hand on the handle of the elevating wheel with the thumb just clear of the safety catch and the fingers on the firing trigger, and right hand grasping the handle of the traversing wheel. Shoulders firmly pressed against the shoulder pads and forehead pressed firmly against the headrest.

ii. *Loader.*

Feet in a most suitable position for preserving balance. Right hand holding the deflector arm and the left hand holding a round in readiness for loading.

NOTE.—The gun is fired by depressing the safety catch and squeezing the firing trigger. Pressure is released from the firing trigger immediately the round has been fired.

3. To unload—Marks I and II guns.

With the right hand, depress the B.M.L. catch and with a sharp movement rotate the B.M.L. This action causes the empty case to be ejected clear of the gun. The B.M.L. of the Mark II gun will be returned to the " closed " position.

NOTE.—When the command " cease firing " is given the bore will be inspected, the breech closed and the firing mechanism released.

10. ORDNANCE, Q.F. 3·7-IN. MARK I MORTAR

1. General.

The 3·7-in. mortar is generally similar to the 3-pr. Mark II gun. The principle particulars relating to the mortar are as follows :—

Weight, including breech mechanism—2 cwt. (approximately).

Calibre.—3·7-ins.

Muzzle velocity.—480 f.s.

Range.—1,800 yards.

The mortar body consists of a barrel, breech ring and securing nut. The barrel extends from the rear face of the chamber to the muzzle. The breech mechanism is designed for hand operation only.

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Component fittings.—Breech block, Mark I fitted with an intermediate firing lever, with retaining screw, plunger and spring. Buffer, Mark I or II is fitted to the upper side of the breech ring and consists of a bronze bracket, fixing screws, plunger and spring.

NOTE.—The Mark I buffer is fitted to mortars Nos. L1 to L10 only, and Mark II buffers to mortars No. 11 and onwards.

Crank, Mark I, is fitted to a pivot for engagement with the link, actuating breech block.

Lever, breech mechanism, Marks I* or II—is fitted with a cam.

Link, actuating breech block—is connected to the breech block by an axis pin with keeper pin.

Washers, actuating shaft, Mark I—for use with actuating shaft on mortars Nos. L1 to L10.

2. Ammunition.

3·7-in. smoke shell.

The total weight of cartridge and shell when fitted = 18 lb.

Weight of projectile = 15 lb.

The smoke shell may be of steel, semi-steel or cast iron, with a solid base. The main filling is a smoke producing substance, usually phosphorus, introduced through the charging hole in the body.

A direct action fuze, 106E, is fitted to the nose of the shell, which contains a high explosive substance, sufficient to open the shell and release the contents without dispersing the smoke substance unduly.

The smoke producer and the explosive must be kept apart, to prevent accident: the latter is contained in a burster container screwed into the body of the shell.

The primary components of the 106E fuze are :—

Safety cap—screwed on to nose of fuze and secured to the body of the fuze by wire.

Hammer—which is forced back on graze or impact.

Brass tape and split collar—keep the hammer forward on discharge and during acceleration of the projectile.

Copper shearing wire—to keep the hammer forward when the brass tape and collar are off.

Steel guide pin—prevents rotation of the hammer.

Detonator.

Shutter.—It is kept closed by a spring until opened against the force of the spring by the spin of the shell in flight. The shutter is made of bronze or hard solid brass, and is a smooth, flat piece of metal. It is drilled to receive an axis pin, and the composition exploding (C.E.). When the latter comes over

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the contact hole in the magazine, *i.e.* when the shutter is fully open, it provides a continuous path of C.E. from the detonator to the bursting charge in the bottom of the fuze.

Magazine.

Action of fuze.—On discharge and so long as the shell is accelerating, *i.e.* until it leaves the bore, the hammer and shutter "set-back": the hammer presses against the tape and prevents it unwinding and the friction between the shutter and diaphragm on which it rests prevents the shutter from opening.

After the shell leaves the bore it begins to decelerate and the back pressure of hammer and shutter cease. The tape is then allowed to unwind and, together with the collars, fly off, and the shutter to open. This leaves the hammer supported by the shearing wire.

On impact the hammer is forced in, shearing the wire and firing the detonator.

3. Stripping—General notes.

i. Before removing or replacing the striker casing it will be necessary to cock the firing mechanism and place the safety catch at "Safe." The axis of the safety catch is designed to act as an additional locking device for securing the striker case to the breech block.

ii. To remove crank and link, actuating breech block—remove keeper pin and axis pin securing link to breech block; withdraw crank and actuating link, disengage the actuating link from the crank.

iii. Before stripping the component parts of the striker casing, set safety-catch at "Fire" and release the mainspring. When replacing the cocking sleeve, insert in striker casing as far as it will go, depress trigger sear and push sleeve right forward. Cock the firing mechanism and put safety catch at "Safe," before assembling the striker case to the breech block.

iv. Stripping other parts :—

Buffers, Mark I or II.—(Remove set-screw from gland, Mark II only.) Remove gland, plunger and spring.

NOTE.—Tool for removing gland:—wrench, breech mechanism, No. 296, Mark I.

Firing lever.—Remove screwed axis pin and firing lever.

Intermediate firing lever.—Remove screwed axis pin, lever, plunger and spring.

4. The mechanism.

The mechanical action of the breech and recoil mechanism, is similar to that of the 3-pr. Mark II gun with the following exceptions :—

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i. *To load.*

On rotating the B.M.L. the cam on the boss of the B.M.L. comes into contact with the plunger of the buffer, and forces the latter into its housing compressing the plunger spring.

The B.M.L. being splined to the actuating shaft, cannot be returned to the " closed " position when the breech is open. As the crank rotates the link actuating breech block is pulled to the right, at the same time describing an arc, the link being connected to the breech block causes the latter to move to the right until the hooks on the extractor levers become engaged in the recesses in the breech block.

Place the round into the chamber until its rim bears against the lips of the extractors, and push the round sharply forward. This action causes the hooks of the extractors to become disengaged from the recesses in the breech block. The spring-loaded plunger of the buffer, bearing against the cam on the boss of the B.M.L., causes the B.M.L. actuating shaft and crank to rotate. This action of the plunger is sufficient to move the breech block a short distance to the left over the base of the round in the chamber, thus holding the round in the chamber. The action of loading is completed by returning the B.M.L. to the " closed " position.

ii. *To fire.*

When the firing mechanism is actuated, the firing lever on the breech ring bears down on the intermediate firing lever, which in turn depresses the sear.

When the gun recoils, the firing lever on the breech ring and the intermediate firing lever are returned to the ready position.

5. Points to be attended to before, during and after firing.

i. Owing to the angle between the telescope and the axis of the bore at extreme range, the end of the telescope is liable to foul the bottom of the sight port if for any reason the gun is depressed with maximum elevation on the sights.

Test as follows.—Fully depress the gun, then rotate the range drum handwheel to the fullest extent or until the telescope fouls the sight port. If it does foul note the point on the range scale. A notice to the effect that if the gun is being fired at that range the gun must not be fully depressed will be placed in a prominent position.

ii. The sight bracket issued for use with the 3·7-in. smoke mortar is provided with an adjusting screw, secured by a lock nut, for adjusting the elevation of the bracket and telescope.

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iii. Ammunition :—

(*a*) Examination.—Examine safety cap and sealing wire. Seal unbroken. Clean if necessary. Remove cartridge clip. Test security of projectile in case.

(*b*) Testing.—Remove striker casing from breech block and test each round in the gun. Unloading must not be violent. Replace cartridge clips, return to box or rack.

NOTES.—1. The sealing wire of the safety cap must not be interfered with. When loading becomes sticky, clean the chamber and lubricate bearing and frictional surfaces. An ejector is issued for removing any projectile that has become lodged in the bore.

2. The seal and wire must only be broken on those rounds required for immediate use.

iv. The tools issued for stripping and cleaning purposes, etc., are similar to those for the 3-pr. gun, with the following differences.

Brushes, sponge, No. 4, Mk. I. (one for water, one for oil).
Rods, brush, sponge, No. 8, Mk. I.
Ejector, projectile, Q.F., 3·7-in mortar.
Wrenches, breech mechanism, No. 296, Mk. I.
Caps, sponge, No. 6, Mk. I.

6. Method of loading and unloading.

i. Open the breech.

ii. Remove round from rack or box.

iii. Remove cartridge clip, cut the sealing wire close to the shoulders of the shell.

iv. Remove safety cap and examine shearing wire and tape. If either are incorrect the round should on no account be fired.

v. Place the round into the chamber and push forward until the hooks of the extractors become disengaged from their recesses in the breech block. The breech block will then move a short distance to the left and hold the round in position.

vi. Return the B.M.L. to the closed position, this action closes the breech and forces the round right home in the chamber.

vii. On completion of loading, the loader will tap the gunner on the forearm.

viii. The method of unloading is similar to that of the 3-pr. Mark II gun (when hand operated), except that the B.M.L. remains in the " Open " position. If it is necessary to unload unfired rounds, the breech must not be opened violently, otherwise the cartridge case may be separated from the projectile.

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APPENDIX No. 1

PROCEDURE TO BE ADOPTED FOR DEMOLISHING UNEXPLODED SHELL

Any service shell which, having failed to explode after being fired, has its fuze intact is a " blind " shell and must be disposed of by demolition with guncotton.

An unexploded shell should never be moved unless it is known to be safe. The danger lies in the possibility of a percussion fuze which has failed to function on impact being ignited by even a slight movement of the shell. All the safety arrangements which render a fuze safe before firing have been automatically removed by the act of firing and the fuze may be in a highly sensitive state. Many shells are found partially buried in the ground. If, after gently scraping the earth from around them, it is not possible to ascertain whether or not the fuzes are intact they should be treated as " blind " shells and demolished.

The stores required for demolishing one shell are as follows :—

One 15-oz. slab of wet guncotton.
One dry guncotton primer.
One No. 8 Mark VII detonator.
A length of safety fuze.
A knife, matches, and a red flag.

Sequence :—

* (*a*) *A qualified officer must be in charge of the party and should himself carry the detonators.* Great care must be taken with these as they will easily explode.

(*b*) The primer, detonators, and wet guncotton should be carried by different persons to minimize the chances of accident.

(*c*) Make certain that the guncotton slab is wet, but do not remove it from its container until actually required.

(*d*) Place the guncotton slab on top of the shell.

(*e*) Place the primer in the hole in the guncotton slab.

(*f*) Cut off about one foot of the safety fuze, light it and test for the time taken to burn out.

(*g*) Next cut off a length of safety fuze, long enough to give ample time to get to cover.

(*h*) Send the whole party, less one N.C.O. or reliable man, away under cover.

* In the case of the Royal Tank Corps, an officer who has qualified at an armament course.

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(*i*) Look around to see that there is no one within 300 yards. Cut one end of the safety fuze diagonally across in order to expose the powder and then insert the other end gently into the detonator.

(*j*) Place the detonator gently into the hole in the primer.

(*k*) Light the end of the fuze by placing the match head on the fuze and rubbing the box across it, and be quite sure the fuze is lit before leaving it.

(*l*) The officer and man should run slowly towards cover together.

(*m*) After taking cover, wait for the explosion and for one minute after explosion.

(*n*) The officer must now go by himself and inspect to see if the explosion has been complete. If satisfactory, the rest of the party may join him.

(*o*) If no explosion takes place at the end of the time in which the fuze should have burned or something is not as it should be wait for a further three minutes before inspecting.

Do not touch any of the stores already used, but start again with fresh demolition charge, which should be placed as near the old one as possible.

Great care must be taken as the original materials are very dangerous.

(*p*) *A red flag must be displayed throughout the operation.*

NOTE.—In the case of the 3·7-in. smoke shells the slab of wet guncotton should be placed over the bursting charge of the shell, i.e. on the shoulder, otherwise there is a danger of the smoke container only being destroyed and the fuze and bursting charge being left untouched. If this type of shell is lying on uneven ground or in such a position that it is not fully supported by the ground against the explosion of the guncotton it is probable that the effect of the guncotton will be merely to displace the shell. In any such case, therefore, it is advisable to use two slabs of wet guncotton in the first instance. By placing these on opposite sides of the bursting charge of the shell detonation thereof is ensured. If the slabs of guncotton are placed so that they touch, only one primer and detonator are necessary to detonate both.

A smoke shell which is smoking after demolition should not be approached, because it is possible that although the phosphorus is burning the bursting charge may be still intact, and if the container, as is likely, has been damaged by the explosion the burning phosphorus may ignite the bursting charge at any time while it is still burning.

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APPENDIX No. 2

GEAR, FIRING, MARK II, WITH CLUTCH OPERATING ON MOUNTINGS Q.F. 3-POUNDER

Plates 1, 2 and 3.

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KEY TO PLATE 1

1. Body.
2. Bracket, hand lever.
3. Lever, hand.
4. Pin, axis, hand lever.
5. Ball, anti-friction.
6. Spring, positioning, hand lever.
7. Plate, guide lever.
8. Blocks, distance, guide plate.

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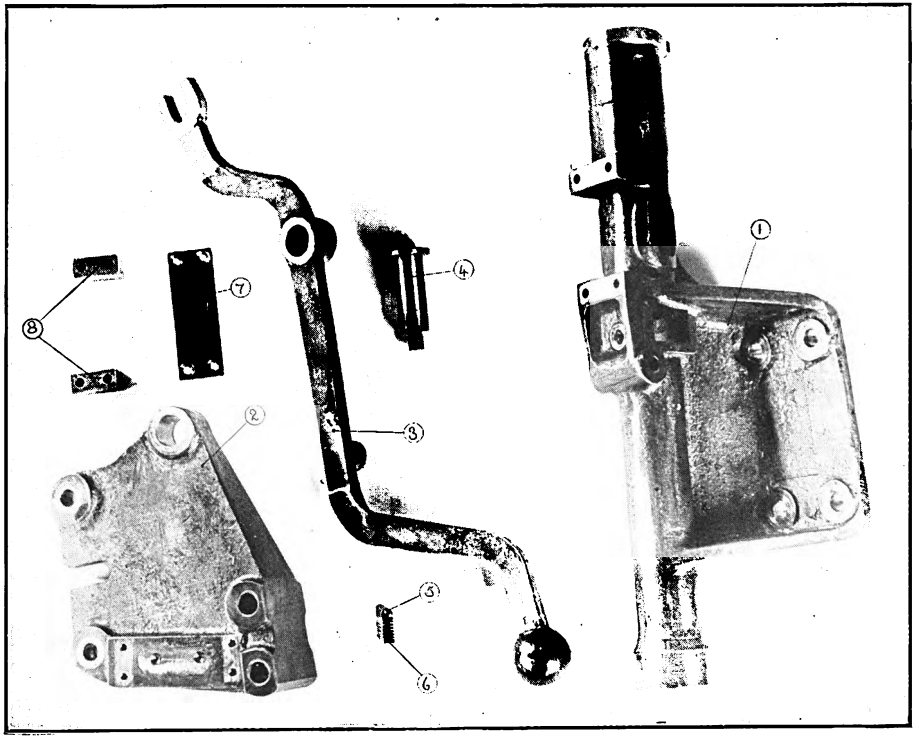

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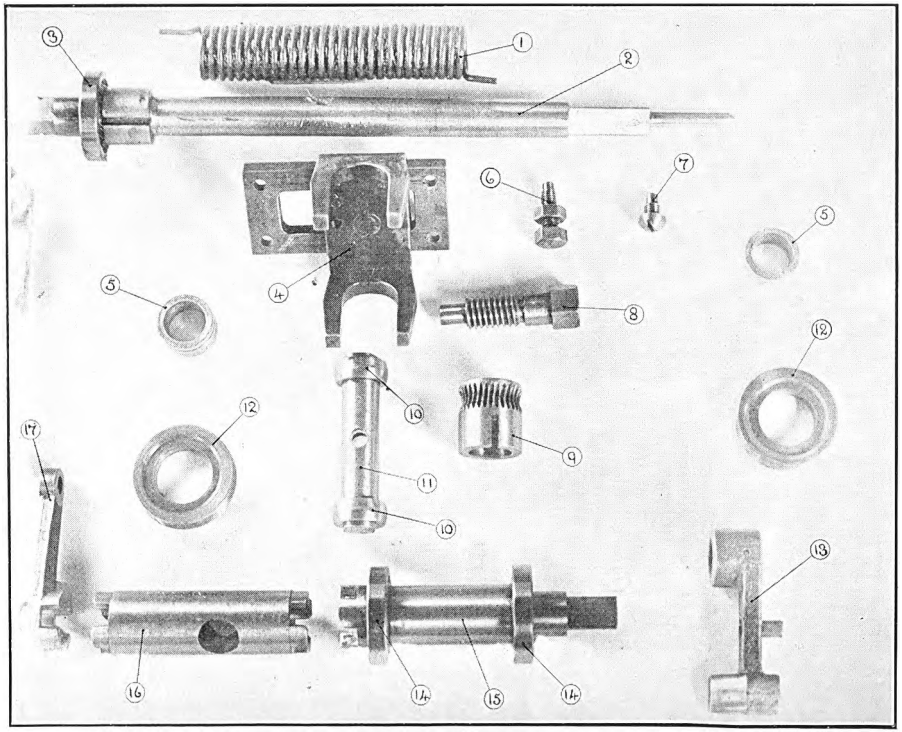

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KEY TO PLATE 2

1. Spring, tension, firing lever shaft.
2. Shaft, firing lever, main.
3. Bearing, journal ball.
4. Slide, fork clutch, operating gear.
5. Collars, distance.
6. Stop, rod, actuating lever.
7. Screw, retaining, rod, actuating lever.
8. Screw, operating, spring sleeve.
9. Sleeve, adjusting, spring tension.
10. Rollers, sleeve, operating selecting sleeve.
11. Sleeve, operating selecting sleeve.
12. Plugs, securing, ball bearings.
13. Lever, firing.
14. Bearing, journal ball.
15. Shaft, firing lever extension.
16. Sleeve, selecting.
17. Lever, M.G., actuating rod.

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KEY TO PLATE 3

1. Lever, actuating, firing lever shaft.
2. Bearing, journal ball.
3. Shaft, firing lever, main.
4. Spring, tension, firing lever shaft.
5. Sleeve, adjusting, spring, tension.
6. Lever, M.G., actuating rod.
7. Sleeve, selecting.
8. Rollers, sleeve, operating selecting sleeve.
9. Sleeve, operating selecting sleeve.
10. Shaft, firing lever extension.
11. Lever, firing.

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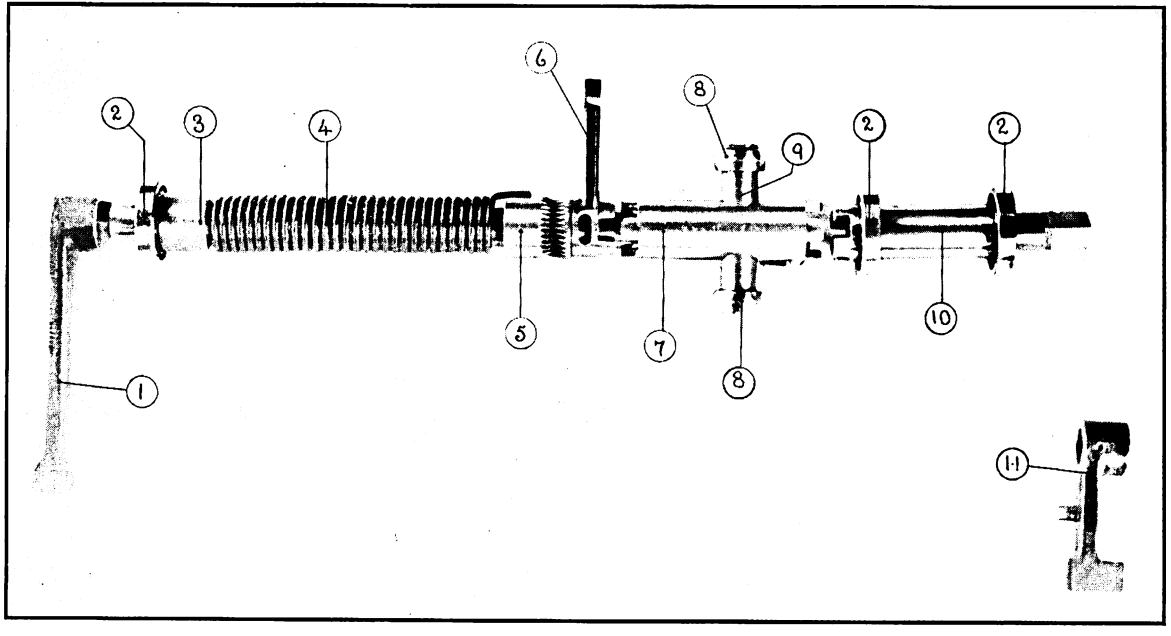
PLATE 3



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Tank Training,

Vol. II, Part III

Pamphlet No. 2

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1936

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TANK TRAINING, VOL. II, PART III

PAMPHLET NO. 2

·303-IN. VICKERS MACHINE GUNS, MARKS VI, IVA, IVB and I

1936

I. INSTRUCTIONAL NOTES

The following general sequences and methods of instruction are applicable to all lessons * contained in this book:—

Preparation.—The class, and everything required for the lesson, must be in position.

Demonstration.—A demonstration of the action which the lesson is intended to teach.

Explanation.—A brief description of the action demonstrated.

Imitation.—Students copy the action of the instructor.

Interrogation.—A cross-examination of students to ascertain that all points of the lesson have been understood.

It is important to note, however, that it would be incorrect in *all lessons* rigidly to adhere to this sequence. In some lessons, for example, it will be desirable to combine demonstration and explanation; on other occasions *imitation* or *interrogation* may be unnecessary. The main points to observe are that the students fully understand the purport of the lesson and, where necessary, are capable of performing any manual operation involved. Unnecessary demonstrations and explanations should be avoided and the instructor must concentrate on *practising* the student, so that the requisite degree of manual skill is attained.

Imitation may be omitted from the sequence in lessons on mechanism, and the time devoted instead to *interrogation.*

* NOTE.—A lesson does not necessarily represent a period of training. Some lessons may require only a few minutes.

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2. GENERAL DESCRIPTION

1. Description of non-recoiling portions.

i. *Barrel casing—Exterior.*

The barrel casing is of steel with longitudinal corrugations for strengthening purposes. Uncorrugated casings may be met with; these are made of thicker material to give the same strength.

On the end cap is fitted the muzzle attachment, which consists of a gland, outer casing and two cups (front and rear).

The gland is screwed to fit into the end cap, and is enlarged at the front end for the assembly of the rear cup, and bored to receive the barrel sleeve. Eight vent holes are provided to permit the escape of gases and any water that may have leaked past the front packing. Four of these vent holes are elongated for the engagement of the combination tool.

Asbestos packing to prevent the escape of water, and to act as a bearing surface for the barrel sleeve, is wound round the barrel sleeve and held in position by the gland.

The outer casing is cylindrical in shape and is screwed internally for assembly to the gland, and bored at the front end to receive the front cup. Slots are provided for the engagement of the combination tool.

Two cups, forming a spherical chamber for the expansion of gases, are held together inside the gland and outer casing. The rear cup, which seats in the gland, is bored to receive the muzzle of the barrel, and the front cup, which seats in the outer casing, is bored for the exit of the bullet.

A foresight, for use when dismounted, is fitted to the end cap, the latter being tapped for the assembly of the foresight screw and fitted with studs for positioning the foresight; corresponding recesses are provided on the rear surface of the sight. A spring, assembled to the foresight screw, exerts a rearward pressure on the body of the foresight, thus retaining the sight in position.

An annular groove is provided in the end cap to receive a rubber joint ring, which seats in front of the protecting jacket of the mounting when the gun is mounted, so forming a gas check.

At the rear end of the barrel casing are two holes, one at the top and one at the bottom; the former is for filling the barrel casing with water and the latter for drawing off water; both holes are closed by screwed plugs, designed to facilitate assembly of the barrel casing into the protecting jacket. The filling hole is placed slightly to the side of the casing. This prevents damage to the steam tube by the filler, and by

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ensuring that the barrel casing is not completely filled reduces the risk of damage by freezing.

A condenser tube boss is fitted at the rear end of the barrel casing on the left hand side. The boss is designed to permit quick assembly of the condenser tube and is bored for the escape of steam.

The steam tube is assembled to the trunnion block of the barrel casing and is retained in position by a keeper screw.

A recess is cut in the rear face of the trunnion block for the engagement of the front cover catch.

At the rear end of the barrel casing is a sleeve, through which the barrel passes on being assembled. The barrel bearing is at the rear end of the barrel casing. When the gun is assembled, the front end of the barrel block bears against the face of the barrel bearing. At the rear end of the barrel casing are the barrel rests to give support to the barrel through the side plates. A slot is cut through the bottom at the rear of the barrel seating face to provide for the escape of any water that may leak through the rear packing of the barrel.

A dovetailed mounting plate is rigidly fixed to the underside of the gun beneath the trunnion block of the barrel casing; it is also bored to take the recoil pin of the mounting. A sleeve is riveted to the mounting base to carry the ejection tube. The mounting plate is slightly tapered in front to facilitate mounting.

ii. *Barrel casing—Interior.*

The barrel casing holds about seven pints of water. The rate of evaporation, during rapid firing, after the boiling point has been reached, is 1½ pints for every 500 rounds. The inside of the barrel casing is tinned to prevent rust.

The front end of the barrel casing contains a gun metal guide and a brass trough; the latter, which extends rearwards, is fitted into the bottom central corrugation of the casing. The brass trough is to facilitate assembling and to prevent the tinned surface of the casing from being scratched off by the muzzle of the barrel. The gun metal guide leads the barrel through the front of the barrel casing when the barrel is being replaced after stripping. It forms a seating for the barrel, and at the same time a seating for the asbestos packing.

The steam tube, which is of brass, consists of a fixed tube and an outer tube (termed the slide valve) arranged to slide freely along the fixed tube. In the fixed tube there is a hole near each end, one of which is closed by the slide valve when the gun is elevated or depressed, thus leaving one hole uncovered to permit the escape of steam. A third hole is drilled in the threaded portion of the head of the steam tube; this is

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connected with the steam escape hole in the boss by a tube attached to the interior of the barrel casing.

The steam tube is screwed into the rear face of the trunnion block, where it is retained in position by a keeper screw, thus ensuring that the hole in the head of the fixed tube coincides with the small steam escape tube attached to the interior of the barrel casing.

iii. *Breech casing—Exterior.*

The breech casing, which is riveted to the barrel casing, consists of :—

(*a*) *Right outside plate.*

The right outside plate is cut away to enable the feed block to be inserted in the gun. The left outside plate is similarly cut away.

To the outside of the right plate is fitted the layshaft bracket. The layshaft is retained in the bracket by a screw which engages a groove in the shaft, being formed at its lower end to engage the slot in the layshaft lever. A slot is cut in the right outside plate for the engagement of the rear cover catch.

The check lever bracket, which is of the Mark II pattern, is riveted to the right plate. Two studs are formed on the bracket for engagement in the holes bored in the plate.

The check lever is secured to the outer stud by a keeper pin, the stud being grooved for the pin, necessary clearance being allowed for the movement of the check lever and pin.

A slot is cut at the rear end of the right outside plate in which the crank bearing slides. The slot is partially closed by a slide which carries a roller, the latter being retained in position by means of a collar and split pin. At the rear end of the right outside plate, near the top, is a hole through which the screwed end of the " T " fixing pin engages. At the rear of the right outside plate, near the bottom, is a hole through which the axis pin of the rear crosspiece passes.

(*b*) *Left outside plate.*

A bracket, with a rectangular stud, is fitted near the front of the left outside plate for the engagement of the loop on the fuzee spring box. The fuzee spring box is of cast aluminium alloy. The front end is formed as a rectangular loop for attachment to the casing, a stud, for holding the rear end of the fuzee box is fitted on the slide and a projection along its length carries an adjusting screw. The screw is retained at the front by a nut and has a vice pin at the rear end for adjusting the tension on the fuzee spring. A screwed sleeve on the adjusting screw has an arm to which the front end of the fuzee spring is

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attached. A stud on the underside of the box is provided for the attachment of the cheek pad.

The fuzee box contains a strong spiral spring called the fuzee spring, the front end of which is attached to the adjusting sleeve, and the rear end connected by the fuzee chain and fuzee with the crank.

The fuzee spring can be adjusted without removing the box, by rotating the vice pin. The action of rotating the vice pin causes the adjusting screw to rotate, and the adjusting sleeve to move backwards or forwards according to the direction in which the adjusting screw is turned. The adjusting screw is kept in position by two nibs on the nut which enter recesses in the front of the fuzee spring box, and are retained by the tension of the fuzee spring.

The left side plate has two hinge brackets for the side opening rear cover; stops are provided on the hinge brackets to limit the side opening of the rear cover.

An extractor safety stop is fitted to the left outside plate, the object of which is to restrict the forward movement of the lock when a first position stoppage occurs, and so prevent the nose of the bullet of the cartridge held by the gib from making contact with the cap of the round in the feed block.

The stop comprises a bracket in which is housed a plunger with spiral spring and a detent which prevents the plunger from turning. On the outer end of the bracket is screwed a cap which retains the plunger and spring and is locked in position by ears on the detent.

A slot is cut at the rear end of the left outside plate in which the crank bearings slide. The slot is partially closed by a slide which carries a stud for the engagement of the fuzee box. At the rear end of the left outside plate, near the top, is a hole to allow the " T " fixing pin to be inserted. At the rear end, near the bottom of the plate, is a hole through which the axis pin of the rear crosspiece passes.

(*c*) *Bottom plate.*

The plate is cut away to allow the extractor to drop. The elevating bracket, which is riveted to the bottom plate near the rear end, is provided with a step on the front face for the engagement of the trigger guard catch.

(*d*) *Rear crosspiece.*

The outside plates are connected at the rear end by the rear crosspiece, which is hinged at the bottom by a screwed joint pin and at the top by the " T " fixing pin.

The rear crosspiece is brought flush with the top of the rear cover. Flanges are cut on the rear face for the assembly of the shoulder piece or rear pad, and a recess allows for engagement of the shoulder piece or rear pad catch.

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Two holes are drilled in the rear crosspiece, the top hole for inspecting the bore and the bottom hole to facilitate clearing of the ejection tube.

(*e*) *Front cover.*

The front cover is hinged on a joint pin attached to the outside plates just behind the feed block. The pin is secured by a check nut with keeper pin. The joint also forms a tie for the outside plates.

The front cover catch is a slam catch fitted to the front cover. It turns in the vertical plane and engages a notch cut in the rear face of the rear cap. A curled thumb-piece projects above the front cover.

A ground sight is mounted in a bracket on the front cover and consists of a shortened Mark II tangent sight stem with a Mark II** slide.

The tangent sight consists of a stem, a plate graduated up to 1,400 yards, and a slide. A rack for engagement by the pinion of the slide is cut along the face of the stem on the right; the graduated plate is secured on the left of the face by upper and lower fixing screws.

The Mark II** slide is divided into two parts by a longitudinal saw cut. The two parts, having the pinion wheel pivoted between them, can be clamped to the stem by means of a clamping nut on the right side to fix the slide in the desired position and to prevent it being jarred down during firing. The right-hand portion of the slide is fitted with a frictional spring to improve the grip between the pinion and the stem. The clamping nut No. 2 is fitted with a thumb-piece. An aperture is provided on the left side, which in conjunction with the foresight provides a means of laying the gun.

The tangent sight, when down, rests on a bridge which is riveted to the front cover.

(*f*) *Rear cover.*

The rear cover is hinged to the left outside plate, and is kept closed by a sliding catch with an upward projecting thumb-piece fitted to a bracket which is solid with the rear cover.

A stud is provided on the top of the cover for the attachment of the cheek pad.

iv. *Breech casing—Interior.*

(*a*) *Front cover.*

A stud is fitted on the underside for the assembly of the front cover catch spring. It also has an extractor stop which acts in conjunction with the extractor stop on the front face

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of the lock casing, in order to prevent the extractor from rising too high.

(*b*) *Rear cover.*

The rear cover and crosspiece are grooved to fit over the edges of the breech casing, so that, when the rear crosspiece is home and secured by the "T" fixing pin, and the rear cover is locked, the casing is kept rigid.

The housing for the trigger lever spring is provided at the front of the cover. Two ramps are fixed on the underside of the rear cover which force the extractor down on recoil.

(*c*) *Right and left outside plates.*

On the inside of both plates are cams which control the path of the extractor. These cams have steps cut in each on the rear sloping surface and provide a means of hanging the lock.

(*d*) *Trigger-guard.*

The trigger guard assembly, which consists of the trigger guard, pistol grip, firing mechanism, loading catch, drip plate and ejection tube, is secured to the breech casing by a sliding catch which engages the step on the front of the elevating bracket.

The finger trigger is formed integral with the sliding bar which is provided with a catch at the front end to engage the layshaft lever. The layshaft lever is held in a bracket on the right-hand side of the trigger guard, and is formed with a spindle which projects upwards through the bracket and is slotted to engage with the layshaft.

When the trigger is pulled back, the layshaft lever imparts a rotary movement to the layshaft. The top of the layshaft is slotted to receive the trigger lever, which is pivoted in a bracket attached to the rear cover. The trigger lever is thus actuated by rotation of the layshaft, and the front end of the lever, making contact with the tail of the gun lock trigger, fires the gun.

The safety catch is situated in the trigger guard frame and is operated by the thumb; the thumb-piece may be fitted on the right or left side as required. It consists of a spring operated plunger which is normally engaged in a step on the sliding bar of the finger trigger. By downward pressure, the safety catch is withdrawn from its engagement and the gun can then be fired.

The trigger spring, which is compressed when the trigger is pulled, returns the firing gear to the normal position when pressure on the finger trigger is released.

The front end of the guard is slotted to receive the rear end

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of the ejection tube; a hole is provided for an axis bush with a split pin, which together retain the ejection tube to the guard.

The ejection tube, which carries the fired and unfired cartridges to the outside of the vehicle, is attached to the front end of the guard by the bush axis pin. A cartridge check consisting of a piece of shaped wire is retained in position by a pin just in front of the hole provided for the bush axis pin. The object of the check is to prevent fired or unfired cartridges from falling back into the breech casing.

At the rear end of the axis bush hole is a small plate set transversely, the lower end of which has two small projections. This plate causes any water that may have leaked from the rear packing of the barrel to drip clear of the gun.

A loading catch is fitted to the trigger guard, and consists of a spindle with toe-piece, the latter being located on the right side of the trigger guard. The spindle is housed in a transverse hole in the guard. A torsional spring is fitted over the spindle, one end of which is anchored to the spindle and the other end to a sleeve secured by a screw on the left side of the guard. A small lever with a chain attached is secured by a screw to the left end of the spindle; the other end of the chain is attached to a stud on the side of the guard.

The trigger guard catch is operated by a thumb-piece situated on the right side of the trigger guard.

2. Description of recoiling portions.

i. *Barrel.*

The barrel is fitted with a sleeve at the muzzle end; the sleeve is coned to form the muzzle cup. The barrel can be withdrawn without removing the muzzle attachment.

At the rear end of the barrel is a cannelure filled with asbestos packing, which prevents the escape of water. At the breech end it is formed with a square block, from which project two studs, one at each side, called the barrel trunnions. By means of these trunnions the barrel is connected to the inner side plates. The front of the barrel block bears against the face of the barrel bearing in the barrel casing.

The face of the barrel block is grooved on each side to take the extractor; also on the face of the barrel block, above the chamber, a bullet guide is provided.

ii. *Side plates.*

Both side plates are bored to receive the barrel trunnions, and have guides along which the flanges of the lock move. These guides have interruptions on each side, to enable the lock to be assembled and removed. In addition each side plate has a bearing through which the crank passes, thus

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connecting the latter with the barrel. These bearings move in slots in the breech casing.

At the front end of each side plate springs are fitted to ensure that the extractor does not drop below the solid cams during the backward movement of the lock when there are no cartridges on the extractor. At the rear end of each side plate are extensions for the exclusion of dust, grit, etc. The left side plate is prolonged to the front and this is known as the prolongation of the left side plate. A recess is provided in the prolongation in which the stud on the bottom lever of the feed block engages.

iii. *Crank.*

The crank is fitted with a connecting rod which is free to rotate on the crank pin. Outside the breech casing, on the right, it has a curved handle, the rear surface of which bears on the roller when the gun is firing. On the left it is fitted with a fuzee to which is attached a chain of two links, by means of which it is connected to the fuzee spring. The fuzee is attached to the crank shaft by means of a stem and lugs.

A hole is drilled through the webs so that the bore may be inspected.

iv. *Connecting rod.*

The connecting rod is attached to the crank by means of an axis pin, called the crank pin, and is arranged to take the lock by means of an interrupted flange, thereby connecting the crank and lock. It has an adjusting nut, and washers are provided which enable its length to be increased. By this means the space between the face of the extractor and the barrel can be adjusted.

v. *The lock.*

The lock is attached to the connecting rod by the side lever head and, when in the firing position, closes the breech. In this position it is held by the side levers, the crank (fixed in bearings in the side plates) and the connecting rod. The connecting rod and side lever head are slightly below the horizontal to prevent the breech from being opened at the moment of firing. During movement the lock has a reciprocating motion communicated to it by the rotation of the crank, and is kept in position during its backward and forward movements by means of flanges working along guides on the side plates, and by the guides on the underside of the rear cover.

The lock casing has a piece riveted on the inside at the top of the front face, which acts as a guide for the assembly of the lock spring and also forms a seating for the spring. Its sides are drilled for the various axis pins, and on its underside it has

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flanges which work on the guides of the side plates. The lower of these flanges has interrupted portions to agree with those in the guides, and allow the lock to be removed and replaced.

The lock casing contains the firing pin, the tumbler, and axis pin, the trigger and axis pin, the sear and spring, and the lock spring. The extractor is attached to the front end of the lock casing by the guide ribs, upon which it slides, and contains the gib, gib spring, and cover. The projection on the gib, together with the cartridge grooves, form recesses which retain the cartridge in position. The extractor is moved upwards by means of the extractor levers and side levers. The upward and downward movement of the extractor are regulated by guide ribs and stops. The top stop on the face of the lock casing, acting in conjunction with the stop on the underside on the front cover, limits the upward travel of the extractor, while the bottom stops formed on the sides of the lock casing limit its downward movement; the extractor levers bear on them.

The lower end of the extractor is reduced in width to enter the groove in the trigger guard. A spring-loaded projecting detent and plunger are fitted in the lower face to retain the fired or unfired cartridge on the face of the extractor, to ensure entry into the ejection tube. The plunger forms an abutment for the spring, and is retained by a detachable cover plate. In later pattern extractors the detent is retained in the extractor by a keeper pin, the plunger and detachable plate are omitted.

vi. *Feed block.*

(*a*) *Right hand.*

The feed block is of steel or gun metal, and fits under the front cover into a recess cut into the breech casing. It is provided with a slide, to which are attached two pawls, with a spring for the purpose of moving the cartridge from right to left. These pawls are made with finger pieces which can be pressed down together, to release the pawls from the belt. The slide has a transverse motion imparted to it by two levers which are fitted together, forming a top and bottom lever. The top lever has a stud which engages a slot on the slide, and on the bottom lever is a stud which engages in the recess in the prolongation of the left side plate. By this means the slide is connected with the recoiling portions. The feed block has also two bottom pawls, connected by a finger piece and actuated by a spring. The bottom pawls engage behind the next cartridge in the belt, thus preventing the belt slipping out of the feed block during the firing of the gun. The feed block

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is provided with guides fitted above and below in the cartridge way, which ensures the cartridges coming to the exact position where they can be gripped by the extractor. The cartridges are prevented from being pushed too far through to the left by means of the cartridge and bullet stops, which are inside the feed block.

(*b*) *Left hand.*

The general construction is on similar lines to that of the right-hand feed block, but differs in the following detail :—

(1) The top lever, which operates the slide, pivots in a separate bearing and is operated by a cam lever which is fitted to the hexagon of the bottom lever. This assembly thus reverses the action of slide, *i.e.* feeding from left to right.

(2) The retaining pawls, known in right-hand feed blocks as " bottom pawls ", are mounted at the top of the body on the left, and retained by two screwed axis pins. A coil spring is substituted for the bottom pawl spring, to retain the pawls in engagement with the cartridge in the belt.

3. General particulars.

Weight of gun.

Without shoulder-piece and without water	41¾ lb. approx.
With No. 3 shoulder-piece but without water	56¾ lb. approx.
With No. 3 shoulder-piece and with water	65½ lb. approx.
Weight of shoulder-piece, No. 3	15 lb. approx.
Weight of water	8¾ lb. approx.

Length of gun :—

Overall—(without shoulder-piece) ...	41·75 inches.
Overall—(with No. 3 shoulder-piece) ...	48·25 inches.

Barrel :—

Weight of barrel	4⅛ lb. approx.
Length of barrel	28·4 inches.
Calibre	·303 inches.
Type of rifling	Enfield system.
No. of grooves	5.
Direction of twist	Left hand.
Pitch	1 turn in 10 inches.
Width of grooves	0·0936 inches.
Depth of grooves	0·005 inches.
Rate of fire	500 rounds a minute (approx.).

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4. General introduction to the weapon.

i. *General instructional notes.*

(*a*) No attempt should be made to teach the general description of the gun as given in this chapter.

(*b*) The student should first see the gun in its service mounting and appreciate its relation to the armament of the vehicle as a whole. The first lesson should, therefore, whenever possible be carried out on a gun mounted in an armoured fighting vehicle.

ii. *Equipment required.*

(*a*) Belt box, belt and dummies.

(*b*) Spare parts complete.

(*c*) Instructional diagrams and cut gun.

iii. *Investigation.*—As for 3-pr. Pamphlet No. 1.

iv. *Sequence of instruction.* (Introduction to the weapon) :—

Name.—·303-in. Vickers M.G. Mark VI.

Weight :—

Gun, without shoulder-piece or water ...	41¾ lb. approx.
No. 3 shoulder-piece	15 lb. approx.
Water	8¾ lb. approx.
Calibre	·303 inches.
Muzzle velocity	2,440 ft. sec.
Extreme range	2,800 yards.
Rate of fire	500 rounds a minute (approx.).
How operated	1. Recoil assisted by gas. 2. Fuzee spring.
Ammunition	250 rounds carried in a webbing belt.
Spares	Sufficient are carried for normal replacements, together with the necessary tools for stripping purposes.
Capabilities ...	Sustained fire and reliability due to :— (*a*) Automatic feed. (*b*) Method of cooling. (*c*) Strong mechanism.
Demonstration ...	The instructor will demonstrate how to load, fire and unload.

3. STRIPPING

1. General remarks.

i. Owing to the limited space in an armoured fighting vehicle, great care must at all times be exercised, to avoid damage, in removing or replacing the gun in the mounting.

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ii. Defects and breakages in machine guns are normally rare. In the majority of cases damage is due to neglect on the part of the gunner.

iii. No direct hammer blows are necessary by the gunner on any part of the machine gun in stripping or assembling.

iv. Great care must be exercised in removing or replacing screwed axis pins; before attempting to remove, ensure that the threads are disengaged. No force is required in replacing the screwed axis pins.

v. Incorrect use of tools will cause damage; therefore the various parts of the gun will be stripped only with the special tools provided.

vi. Damage to the front and rear covers can be avoided; the covers should be raised, not flung open. When closing, ensure that the lock and feed block are replaced correctly.

vii. Before any stripping is begun the gun must always be *unloaded.*

viii. Operations marked with an asterisk will only be performed by an armourer.

2. Removing and replacing the gun in the mounting.

i. *Mountings M.G. No. 5 co-axially mounted with the 3-pr. gun.*

(*a*) Place the turret at 12 o'clock and clamp.
(*b*) Disconnect the condenser tube by unscrewing the union nut from the steam escape extension tube.
(*c*) Remove the rear pad.
(*d*) Elevate the 3-pr. gun.
(*e*) Disconnect the actuating arm of the co-axial firing mechanism from engagement with the finger trigger of the M.G. by pushing the actuating arm into its housing and rotating clockwise, where it is retained by a keep pin.
(*f*) Disconnect the loop of the safety catch retainer.
(*g*) Remove the gun securing pin, at the same time steadying the gun with the disengaged hand.
(*h*) Lock the mounting by inserting the larger end of the gun securing pin into the hole drilled through the right top corner of the frame and mantlet.
(*i*) Slacken the clamping strip from engagement with the mounting base of the gun, sufficiently to enable the gun to be withdrawn.
(*j*) Disengage the recoil pin from the mounting base by pushing the pin upwards, rotating clockwise and pulling down. The gun must be steadied with

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the disengaged hand to prevent it falling out of the mounting.

(*k*) Remove the gun.

Replace the gun in the mounting in the reverse order.

NOTES.—1. If there is water in the barrel casing, keep the condenser tube upright to avoid loss of water.

2. Care must be taken not to damage the ejection tube in removing or replacing the gun in the mounting.

ii. *Mountings, M.G. No. 6, in the turret of the Lanchester armoured car (for one ·303-in. M.G. and one ·5-in. M.G.).*

(*a*) Place the turret at 12 o'clock and lock the mounting.
(*b*) Disconnect the condenser tube by unscrewing the union nut from the steam escape extension tube.
(*c*) Remove the shoulder pieces from both guns.
(*d*) Remove the brow pad and telescope.
(*e*) Now remove each gun in the following sequence, beginning with and completing the ·303-in. M.G. before the ·5-in. M.G.
  (1) Slacken the clamping strip from engagement with the mounting base of the gun, sufficiently to enable the gun to be withdrawn.
  (2) Disengage the recoil pin from the mounting base by pushing the pin upwards, rotating clockwise and pulling down. The gun must be steadied with the disengaged hand to prevent it falling out of the mounting.
  (3) Remove the gun.

Replace the gun in the mounting in the reverse order.

NOTES.—1. If there is water in the barrel casing of the ·303-in. M.G., keep the condenser tube upright to avoid loss of water.

2. Care must be taken not to damage the ejection tube in removing or replacing the guns in the mounting.

iii. *Mountings, M.G. No. 7, in Lanchester and Crossley armoured cars.*

(*a*) Disconnect the condenser tube by unscrewing the union nut from the steam escape extension tube.
(*b*) Remove the shoulder-piece and cheek pad.
(*c*) Remove the brow pad and telescope.
(*d*) Slacken the clamping strip from engagement with the mounting base of the gun, sufficiently to enable the gun to be withdrawn.

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(*e*) Disengage the recoil pin from the mounting base by pushing the pin upwards, rotating clockwise and pulling down. The gun must be steadied with the disengaged hand to prevent it falling out of the mounting.

(*f*) Remove the gun.

Replace the gun in the mounting in the reverse order.

NOTES.—1. If there is water in the barrel casing, keep the condenser tube upright to avoid loss of water.

2. Care must be taken not to damage the ejection tube in removing or replacing the gun in the mounting.

iv. *Mountings, M.G. No. 8, in light tanks and Crossley armoured cars.*

(*a*) Place the turret at 12 o'clock and lock the mounting.

(*b*) Disconnect the condenser tube by unscrewing the union nut from the steam escape extension tube.

(*c*) Remove the shoulder-piece and cheek pad.

(*d*) Remove the brow pad and telescope.

(*e*) Slacken the clamping strip from engagement with the mounting base of the gun, sufficiently to enable the gun to be withdrawn.

(*f*) Disengage the recoil pin from the mounting base by pulling down. The gun must be steadied with the disengaged hand to prevent it falling out of the mounting.

(*g*) Remove the gun.

Replace the gun in the mounting in the reverse order.

NOTES.—1. If there is water in the barrel casing, keep the condenser tube upright to avoid loss of water.

2. Care must be taken not to damage the ejection tube in removing or replacing the gun in the mounting.

3. Normal stripping.

The gun, having been removed from the mounting, will be stripped in the following sequence :—

i. *Lock.*

Unload ; pull the crank handle back on to the roller and open the rear cover ; with the extractor in the lowest position, place the forefinger of the left hand on the extractor stop, the remaining fingers gripping the sides of the lock casing, and lift out the lock, at the same time allowing the crank handle to move slightly forward until the lock flanges are disengaged from those of the side plates. Give the lock one-sixth turn and remove from the connecting rod, the thumb of the right hand being on the milled portion of the connecting rod. Ease

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the crank handle on to the check lever, close the rear cover, and ease the lock spring.

To ease the lock spring.—With the extractor in the highest position, press the side lever head down on to the tail of the sear; this action disengages the bent of the sear from the bent of the firing pin. Raise the side lever head until it rests against the tail of the tumbler. Pull the the tail of the trigger to the rear; this action disengages the nose of the trigger from the bent of the tumbler and causes the tail of the tumbler (due to action of the lock spring forcing the firing pin forward) to bear hard on the side lever head; lower the side lever head.

ii. *Condenser tube.*

Disengage the quick release catch from the condenser tube boss by pressing downwards and remove the tube from the boss.

iii. *Trigger guard.*

Press the thumb piece of the trigger guard catch forward and lower the trigger guard. Withdraw the trigger guard to the rear, taking care not to damage the ejection tube.

N.B.—In removing or replacing the trigger guard, the finger must be clear of the trigger.

iv. *Outer casing muzzle attachment, and front and rear cups.*

With the combination tool unscrew the outer casing from the gland, and remove the front and rear cups.

N.B.—When the outer casing is removed, the front and rear cups become loose; therefore care must be taken to ensure that these cups do not become damaged by falling to the ground.

v. *Feed block.*

Raise the front cover and lift out. Close the front cover.

vi. *Fuzee spring box.*

With the right hand at the rear of the box and the left at the front, press the box forward until clear of the bracket and stud. Disconnect the fuzee chain and remove the fuzee box and spring.

vii. *Fuzee.*

Turn the fuzee to the rear until the lugs on the stem are free to be withdrawn, and remove.

viii. *Recoiling portions.*

Unscrew and remove the " T " fixing pin; lower the rear crosspiece; remove the right and left slide; draw out the recoiling portions; disconnect the side plates from the barrel.

The gun will be assembled in the reverse order, with particular attention to the following notes :—

1. Care must be taken to ensure that the connecting rod and the packing in the cannelure are not damaged.

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2. When replacing the barrel, ensure that the bullet lead is uppermost.

4. Stripping the lock.

i. *To strip.*

Cock the lock by pressing the side lever head upwards against the tail of the tumbler until the bent of the sear and bent of the firing pin are engaged. With the " T " fixing pin or No. 5 punch, force out the pin split keeper, bush axis side lever and axis bush; remove the side lever, extractor levers and extractor. Remove the tumbler axis pin and tumbler. Release the lock spring by pressing down on the tail of the sear; remove the trigger axis pin, trigger and lock spring. Remove the firing pin and sear.

ii. *To assemble.*

The lock is assembled in the reverse order to that of stripping, with the exception of the lock spring, which is replaced last. In replacing the firing pin the bent of the firing pin will be engaged with the bent of the sear.

When assembling the lock spring, hold the extractor in the highest position, and push the tail of the trigger to the rear; force down the side lever head, depressing the tail of the sear; retaining it in this position, force down the tail of the tumbler; this action forces the firing pin forward; with the long arm of the lock spring to the front of the lock casing, force in the lock spring.

5. Stripping the feed block—Right and left hand.

i. *Right hand.*

(*a*) *To strip.*

With the " T " fixing pin or No. 5 punch, force out the split keeper pin; separate the top and bottom levers; take out the slide with feed pawls. To remove the feed pawls and spring—depress each pawl separately and push outwards, thus disengaging the pawl from the fixed axis pin on the slide. Remove the spring.

Draw out the axis pin positioning the retaining pawls, remove the pawls and spring.

(*b*) *To assemble.*

The feed block is assembled in the reverse order. When replacing the feed pawls and spring to the slide—replace the spring, depress the ends of the spring and replace the pawls to the axis pin.

N.B.—Special care must be taken to ensure the correct assembly of the top and bottom levers.

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ii. *Left hand.*

(*a*) *To strip.*

The method of stripping the left hand feed block is similar to that of the right hand feed block, with the exception of the retaining pawls and spring, which are removed in the following manner—remove the screwed axis pins and lift out the pawls and spring.

(*b*) *To assemble.*

Reverse the order of stripping.

NOTES.—1. The stripping of feed blocks will only be carried out when ordered.

2. D.P. feed blocks only will be used for instructional purposes.

6. Stripping other parts.

i. *By the gunner :—*

(*a*) *Gland.*

Unscrew.

(*b*) *Roller.*

Remove the split keeper pin from the collar; take off the collar and roller.

(*c*) *Gib and gib spring.*

Drive off the gib cover, remove the gib spring and gib.

N.B.—In order to prevent damage it is advisable to remove the gib cover with a brass drift.

Assemble in the reverse order.

ii. *By qualified armourer only :—*

(*a*) *Foresight.**

Remove the split keeper pin fixing the foresight screw; remove the foresight screw, spring and foresight.

(*b*) *Steam tube.**

Remove the front cover; place the gun on end, so that it stands on the outer casing of the muzzle attachment, remove the keeper screw from the head of the steam tube and unscrew the steam tube.

(*c*) *Front cover catch and spring.**

Remove the split keeper pin and axis pin of the front cover catch; lift out the catch and spring.

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(*d*) *Tangent sight.**

Remove the keeper pin from the spindle nut, situated on the right side of the housing. Unscrew and remove the spindle nut; remove the stem with spindle and spring from the housing.

(*e*) *Tangent sight slide.**

Remove the upper screw fixing the graduated plate to the stem; remove the slide; take out the friction spring. Remove the split keeper pin retaining the clamping nut; unscrew the clamping nut and remove the washer and pinion from the slide.

(*f*) *Front cover.**

Remove the split keeper pin from the check nut; unscrew the check nut; remove the axis pin and front cover.

(*g*) *Trigger lever and spring.**

Remove the split keeper pin from the nut securing trigger lever; unscrew the lock nut. From the underside of the rear cover remove the trigger lever and spring.

(*h*) *Rear cover catch and spring.**

Open the rear cover and remove the screw retaining milled finger piece; remove the catch, spring and finger piece.

To assemble, engage the projection on the finger piece with the projection on the catch, and insert a short distance into the bracket; replace the spring, and screw retaining the finger piece.

N.B.—Ensure that the screw retaining finger piece is screwed home correctly.

(*i*) *Rear cover.**

Remove the split keeper pins and hinge pins; remove the rear cover.

(*j*) *Extractor safety stop.**

Depress the detent of the extractor safety stop, disengaging the ears of the detent from engagement with the cap. Unscrew and remove the safety stop cap; remove the detent, spring and safety stop.

(*k*) *Rear crosspiece.**

Remove the keeper pin from the check nut; unscrew the check nut; remove the joint pin and rear crosspiece.

(*l*) *Crank handle.**

Remove the screwed fixing pin; remove the crank handle.

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(*m*) *Check lever.**

Force out the keeper pin from the underside and take off the check lever.

(*n*) *Layshaft.**

Remove the screw retaining layshaft, remove the layshaft.

(*o*) *Trigger guard assembly.**

(1) *Ejection tube.*

Force out the bush axis split keeper pin and bush.

(2) *Cartridge check.*

Remove the cartridge check axis pin, and check.

(3) *Layshaft lever.*

Remove the screw retaining layshaft lever; depress the trigger catch and rotate the lever until clear of the trigger mechanism; remove the layshaft lever.

(4) *Finger trigger, with catch and axis pin.*

Lift out the finger trigger. Force out the axis pin of the trigger catch; lift out the catch and spring. Force out the axis pin retaining finger trigger spring guide, and remove the guide and spring.

(5) *Safety catch.*

Remove the screw fixing the thumbpiece of the safety catch to the plunger; remove the thumbpiece, plunger and spring.

(6) *Loading catch.*

Remove the keeper screw from the loading catch lever; remove the lever; withdraw the loading catch and spring. Remove the screw retaining loading catch sleeve; remove the sleeve.

(7) *Trigger guard catch.*

Press the trigger guard catch forward until the heads of the two screws retaining the thumb piece of the catch can be removed; the heads of the screws are exposed in the two holes on the left side of the trigger guard. Remove the screws and thumb-piece. Lift the trigger guard catch upwards, and remove. Force out the axis pin retaining trigger guard catch spring guide and remove the guide and spring.

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(*p*) *Extractor detent Mark II.**

(1) *No.* 1.—Using a No. 3 punch, depress the plunger clear of the detent cover; remove the detent cover by sliding it towards the lower end of the extractor; remove the plunger and projecting detent.

(2) *No.* 2.—Force out the detent pin; remove the detent and spring.

(*q*) *Sear spring.**

The sear spring is removed and a new spring placed in position by using the new spring as a punch to force out the old one.

7. Method of instruction.

i. *Object.*

As for 3-pr. Pamphlet No. 1.

ii. *Equipment required.*

(*a*) Gun correctly assembled in the mounting.

(*b*) Spare parts and tools.

iii. *Sequence of instruction.*

Instruction in stripping will be given in the sequence set out below. Each stage should be thoroughly understood before the next is begun.

Stage 1. Removing and replacing the gun in the mounting.

Stage 2. Normal stripping for cleaning.

NOTE.—Before this lesson is begun, each member of the crew will be practised in :—

(*a*) Unloading the gun and removing the lock.

(*b*) Firing and cocking the lock.

(*c*) Replacing the lock in the gun.

Stage 3. Stripping the lock.

Stage 4. Stripping the feed block.

Stage 5. Stripping other parts.

4. THE MECHANISM

1. General remarks.

The mechanism of the gun as set out below deals with the whole cycle of operations, and is divided into stages to simplify instruction.

2. The mechanism.

i. *To load.*—(For guns fitted with a right-hand feed block.)

(*a*) Pass the tag end of the belt through the feed block from the right side.

(*b*) With the right hand, pull the crank handle on to the roller.

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(*c*) With the left hand, pull the belt through to the left front as far as it will go.

(*d*) Let go the crank handle. The first cartridge will then be gripped by the extractor. Repeat the above, and, when this has been done, the first cartridge will be in the chamber, and another gripped by the upper part of the extractor. The gun is then ready for firing.

The crank handle is pulled to the roller in order to withdraw the lock; allow the cartridge to be pulled into position in the feed block, to cock the lock and allow the extractor to drop.

NOTE.—For guns fitted with a left-hand feed block the mechanism is similar to that described above with the following exceptions :—

(1) The tag end of the belt is passed into the feed block from the left side.

(2) The belt is pulled to the right front.

Method of instruction.

To prepare the gun.

Fire the lock and open the rear cover.

Demonstration.

Load.

Explanation.

(1) Tag of belt.
(2) Crank handle pulled on roller.
(3) Belt pulled to left or right, and slightly to the front.
(4) Crank handle released.
(5) Repetition of above.
(6) Cartridge in chamber.
(7) Cartridge gripped by extractor.
(8) Gun ready for firing.
(9) Reasons for pulling back crank handle.

Interrogation.

ii. *To fire.*

Depress the safety catch situated on the right or left side of the pistol grip. This action disengages the plunger of the safety catch from engagement with the sliding bar of the finger trigger. Pull the finger trigger to the rear, when the gun will fire automatically until—

(*a*) pressure is released from the trigger, or
(*b*) ammunition in the belt is expended.

The lock will be forward.

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In the case of (*a*) the extractor will be gripping a live cartridge in the feed block and a live cartridge in the chamber, and the lock will be cocked.

In the case of (*b*) the extractor will be clear and the lock fired.

NOTE.—The safety catch on the M.G. co-axially mounted with the 3-pr. gun is permanently out of engagement.

Method of instruction.

To prepare the gun.
Load.
Demonstration.
Fire the gun.
Explanation.
(1) Safety catch depressed.
(2) Finger trigger pulled back.
(3) Rounds on the extractor when pressure is released.
(4) No rounds on the extractor when ammunition is expended.
Interrogation.

iii. *To unload.*

Pull the crank handle on to the roller twice in succession (without pulling the belt), letting it fly forward to the check lever each time. Release the lock spring. Release the feed and retaining pawls from the belt and remove the belt from the feed block until the first round is clear.

Method of instruction.

To prepare the gun.
Load, and open the rear cover.
Demonstration.
Unload.
Explanation.
(1) Crank handle pulled on to the roller twice.
(2) Lock spring eased.
(3) Pawls released from belt.
(4) Belt removed.
Interrogation.

iv. *Action on recoil.*

Suppose the gun to have just fired the first cartridge. The extractor will be gripping the second live cartridge in the feed block and the empty case of the round just fired, which is in the chamber. The explosion will cause the recoiling portions to move backwards through a distance of about 1 inch, thereby extending the fuzee spring.

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This backward movement is due partly to the force of the explosion and to the effect of the gases on the muzzle attachment, which act as follows.—The gases of the propellant charge which escape through the muzzle after the exit of the bullet are trapped in the spherical gas chamber formed by the front and rear cups; the expanding gases, acting on the muzzle cup of the barrel sleeve, assist in driving the recoiling portions to the rear. The gases then escape through the vents in the gland and the bullet exit hole in the front cup.

Method of instruction.

To prepare the gun.

Remove the outer casing and the front and rear cups of the muzzle attachment. Load the gun with an empty case in the chamber and a dummy round in the feed, both gripped by the extractor; fire the lock. Remove the fuzee spring and box; open the rear cover, hinge down the rear crosspiece and remove the right slide; refix the rear crosspiece.

Demonstration.

Push back the recoiling portions from the front.

Explanation.

(1) Explosion.
(2) Recoiling portions driven backwards about 1 inch.
(3) Fuzee spring extended.
(4) Action of gases in muzzle attachment.

Interrogation.

v. *First action in the feed block.*

(*a*) *For guns fitted with right-hand feed block.*

As the recoiling portions move backwards, the recess in the prolongation of the left side plate carries with it the stud on the bottom lever of the feed block. The bottom lever acting on the top lever causes the slide and feed pawls to move to the right, enabling the feed pawls to engage behind the cartridge already held in position by the re taining pawls.

(*b*) *For guns fitted with left-hand feed block.*

The action is similar to that for right feed block, with the following differences—the bottom lever, acting on the cam lever, causes the stud of the cam, which is engaged in the slotted lug of the top lever, to move the slide and feed the pawls to the left, enabling the feed pawls to engage behind the cartridge already held in position by the retaining pawls.

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Method of instruction.

To prepare the gun.

As for " Action on recoil ", except that the front cover will be opened instead of the rear cover.

Demonstration.

Push the recoiling portions back from the front.

Explanation.

(1) Recess in the prolongation of the left side plate.
(2) Stud on the bottom lever.
(3) Bottom lever acting on the top lever. (Cam lever and stud for left-hand feed block.)
(4) Slide moving to the right. (Left, for left-hand feed block.)
(5) Feed pawls engaging behind the cartridge held by the bottom pawls.

Interrogation.

vi. *Backward rotation of the crank.*

The backward movement of the recoiling portions causes the tail of the crank handle to roll on the roller, thereby rotating the crank. The rotation of the crank withdraws the lock and causes the fuzee to wind the fuzee chain, thus further extending the fuzee spring.

Owing to the momentum of the lock, connecting rod, crank and crank handle the crank handle continues to roll against the roller. This rolling action of the crank handle on the roller, assisted by the fuzee spring, forces the whole of the recoiling portions forward with the exception of the lock, which continues its backward movement until the extractor is free to drop before joining in the forward movement.

Method of instruction.

To prepare the gun.

Remove the outer casing and the front and rear cups of the muzzle attachment. Load the gun with an empty case in the chamber and a dummy round in the feed block, both gripped by the extractor. Remove the fuzee spring and box, and open the rear cover. (The lock is left cocked to simplify the demonstration.)

Demonstration.

Backward rotation of the crank demonstrated by pushing back the recoiling portions.

Explanation.

(1) Recoiling portions moving back ; tail of crank handle bearing against the roller.
(2) Rotation of the crank ; lock withdrawn ; fuzee chain wound round fuzee.

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(3) Momentum of lock, etc.
(4) Barrel and side plates moving forward.
(5) Lock continuing to the rear.
(6) Barrel and side plates home; lock free to move forward.

Interrogation.

vii. *Second action in the feed block.*

(*a*) *For guns fitted with right-hand feed block.*

As the recoiling portions move forward, the recess in the prolongation of the left side plate carries with it the stud on the bottom lever of the feed block. This bottom lever, acting on the top lever, causes the slide and feed pawls to move to the left. The feed pawls, being engaged behind the cartridge held by the retaining pawls, carry this cartridge into position in the feed block against the cartridge and bullet stops ready to be gripped by the extractor. The belt, as it moves to the left slides between the retaining pawls, which are depressed as the cartridge passes over them, and rise behind the next cartridge in the belt, so retaining the belt in the feed block, when the extractor has withdrawn the cartridge positioned in the feed block by the feed pawls.

(*b*) *For guns fitted with left-hand feed block.*

The action is similar to that for right-hand feed block except that the bottom lever, acting in conjunction with the cam lever, causes the stud of the cam lever, which is engaged in the slotted lug of the top lever, to move the slide and feed pawls to the right.

Method of instruction.

To prepare the gun.

Load the gun with an empty case in the chamber and a dummy round in the feed block, both gripped by the extractor. Remove the fuzee spring and box, pull back the recoiling portions and raise the crank handle to the vertical position, and open the front and rear covers.

Demonstration.

Recoiling portions forced forward by the continued bearing of the crank handle on the roller.

Explanation.

(1) Recess in the prolongation of the left side plate.
(2) Stud on bottom lever.

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(3) Bottom lever acting on top lever. (Cam lever and stud for left-hand feed block.)
(4) Slide moving to the left. (Right, for left-hand feed block.)
(5) Feed pawls carrying the cartridge into position in the feed block.
(6) Cartridge guide, cartridge and bullet stops.
(7) Retaining pawls engaging behind nxet cartridge.

Interrogation.

viii. *Backward movement of the lock.*

As the lock moves backwards, the extractor withdraws the live round from the feed block and the empty case from the chamber. The horns of the extractor move along the surface of the cams until the cartridge is clear of the belt; the left horn of the extractor, coming into contact with the spring loaded extractor safety stop plunger, forces the latter into its housing, thus allowing the horn to pass by. Immediately the left horn is clear of the plunger, the latter, owing to the action of its spring, is forced out. When the left horn of the extractor is clear of the safety stop, the horns of the extractor bearing against the curved ramps on the underside of the rear cover cause the extractor to drop, thus placing the round from the feed block in line with the chamber, and the empty case in line with the ejection tube.

The round from the feed block is prevented from slipping down the face of the extractor by the bottom projection of the gib, and the empty case is held on the extractor by the projecting detent. If for any reason the lock does not come far enough back to allow the extractor to drop, the extractor safety stop prevents the lock from going forward and the horns of the extractor from riding forward on the surface of the solid cams, thus preventing the bullet of the cartridge held by the extractor from piercing the cap of the round brought into position in the feed block, so preventing a feed block explosion.

Method of instruction.

To prepare the gun.

Remove the outer casing and the front and rear cups of the muzzle attachment, load the gun with an empty case in the chamber and a dummy round in the feed block, both gripped by the extractor. Fire the lock, remove the fuzee spring and box, and open the rear cover.

Demonstration.

Push back the recoiling portions.

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Explanation.

(1) Withdrawal of cartridge from feed block and empty case from chamber.
(2) Horns of extractor riding along cams.
(3) Depression of safety stop by left horn of extractor.
(4) Extractor forced down by ramps.
(5) Cartridge in line with chamber, empty case in line with ejection tube.
(6) Cartridge and empty case held on extractor.

Interrogation.

ix. *Cocking action of the lock.*

The rotation of the crank gives an upward motion to the connecting rod and side lever head; the latter, bearing on the tail of the tumbler, rotates the tumbler on its axis; the head of the tumbler, being engaged in the recess of the firing pin, draws the firing pin to the rear. The long arm of the lock spring is bearing against the projection on the firing pin, and the short arm against the nose of the trigger; consequently the withdrawal of the firing pin compresses the lock spring. As the tumbler rotates, the short arm of the lock spring forces the nose of the trigger over the bent of the tumbler, and the continued rotation of the tumbler draws the firing pin still further to the rear, until the bent of the sear (which is actuated by the sear spring) is forced into engagement with the bent of the firing pin, thus holding the firing pin to the rear. The lock is now cocked.

Method of instruction.

To prepare the gun.

Remove the outer casing and the front and rear cups of the muzzle attachment, load the gun with an empty case in the chamber, and a dummy round in the feed block, both being held by the extractor. Fire the lock, remove the fuzee spring and box, and open the rear cover.

Demonstration.

(Using gun and cut lock.) Push the recoiling portions to the rear; continue the demonstration with cut lock.

Explanation.

(Using gun and cut lock or/and diagrams.)

(1) Upward movement of side lever head.
(2) Rotation of tumbler.
(3) Firing pin withdrawn.
(4) Compression of lock spring.
(5) Nose of trigger and bent of tumbler.
(6) Bents of sear and firing pin.

Interrogation.

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x. *Action of the fuzee spring.*

When the force of the explosion is expended, the fuzee spring unwinds the fuzee chain from the fuzee. This action gives a forward rotary movement to the crank, thus causing the connecting rod and side lever head to move forward and downwards, so causing the lock to move forward.

Method of instruction.

To prepare the gun.

Load the gun with an empty case in the chamber and a dummy round in the feed block, both being held by the extractor. Disengage the rear end of the fuzee spring box, pull the crank handle back on to roller and pull the belt.

Demonstration.

(1) Hold the fuzee spring box away from the breech casing so that the fuzee and fuzee spring can be seen.

(2) Open the rear cover, when necessary, to show rotation of the crank and lock moving forward.

Explanation.

(1) Fuzee spring unwinding, fuzee chain, fuzee, and rotation of crank.

(2) Forward and downward movement of connecting rod and side lever head.

(3) Lock moving forward.

Interrogation.

xi. *Forward movement of the lock.*

As the lock travels forward, the extractor places the live round in the chamber and the empty case in the ejection tube. The side levers, acting on the extractor levers, cause the extractor to rise. The projecting detent rides over the base of the fired cartridge in the ejection tube; the empty case is prevented from falling back into the breech casing by the cartridge check. The bottom projection of the gib slides over the base of the cartridge in the chamber and the top projection of the gib slides over the base of the cartridge in the feed block.

When the extractor reaches its highest position, the firing pin hole is brought opposite the cap of the cartridge in the chamber, and the side plate springs engage in grooves each side of the extractor, near the bottom. The springs prevent the horns of the extractor from falling and fouling the front end of the solid cams in the breech casing, at the beginning of the backward movement when the face of the extractor is clear.

The further movement of the connecting rod and side lever head completes the locking of the breach (see Sec. 4, xvii).

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During this movement the steps on the side levers ride over and engage with the bents on the extractor levers.

Method of instruction.

To prepare the gun.

Place on the extractor a dummy cartridge between the upper and lower projections of the gib and an empty case held by the extractor detent ; keep the crank handle back on the roller, pull the belt and open the rear cover.

Demonstration.

(1) Crank handle eased forward on to check lever.
(2) Cut lock.

Explanation.

Using gun, cut lock or/and diagrams.

(1) Cartridge in line with chamber, empty case in line with ejection tube.
(2) Side levers actuating extractor levers.
(3) Extractor rising.
(4) Projecting detent.
(5) Bottom and top projection of gib.
(6) Firing pin hole opposite cap.
(7) Side plate springs.
(8) Further downward movement of connecting rod and side lever head.
(9) Breech closed.

Interrogation.

xii. *Firing action—First shot.*

As the side lever head comes slightly below the horizontal, it depresses the sear, thus disengaging the bent of the sear from the bent of the firing pin ; the latter thus moves slightly forward until the bent of the tumbler engages with the nose of the trigger.

When the safety catch is depressed and the finger trigger pulled back, the trigger catch causes the layshaft lever to rotate. The recess in the head of the layshaft is engaged with the lug on the trigger lever ; the trigger lever therefore, moves with the layshaft. The trigger lever, making contact with the tail of the gun lock trigger, draws the latter to the rear, thus disengaging the nose of the trigger from the bent of the tumbler. The long arm of the lock spring, being engaged behind the projection on the firing pin, carries the pin forward on to the cap and explodes the charge.

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Method of instruction.

To prepare the gun.

Load. Remove the trigger lever and engage the lug on the trigger lever in the recess in the head of the layshaft.

Demonstration.

(1) Cut lock.
(2) Remove trigger guard to show action of safety catch and firing mechanism.
(3) Using gun.

Explanation.

Using cut lock and gun.

(1) Bents of sear and firing pin.
(2) Nose of trigger and bent of tumbler engaged.
(3) Safety catch depressed, finger trigger pulled back.
(4) Rotation of layshaft.
(5) Action of trigger lever.
(6) Tail of trigger drawn back; nose of trigger disengaged from bent of tumbler.
(7) Action of long arm of the lock spring.
(8) Firing pin exploding charge.

Interrogation.

xiii. *Firing action—Subsequent shots.*

By maintaining pressure on the finger trigger, the trigger lever is held back, so that each time the lock travels forward the trigger lever holds back the tail of the gun lock trigger before the lock is quite home. By this means the nose of the trigger is prevented from engaging the bent of the tumbler. When the lock is right home, the side lever head depresses the sear, thus disengaging the bent of the sear from the bent of the firing pin, so allowing the long arm of the lock spring to carry the firing pin forward on to the cap, exploding the charge.

The depression of the sear is so timed that the firing pin cannot be released until the lock is in the firing position.

Method of instruction.

To prepare the gun.

As for firing action first shot.

Demonstration.

Using gun and cut lock.

Explanation.

Using gun and cut lock.

(1) Pressure maintained on finger trigger.
(2) Trigger lever held back.
(3) Tail of trigger held back before lock goes home.

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(4) Nose of trigger and bent of tumbler.
(5) Depression of sear.
(6) Action of lock spring.
(7) Timing of sear.
Interrogation.

xiv. *Action inside the lock when pressure on the finger trigger is released.*

When pressure is released from the finger trigger, the trigger lever is allowed to resume its normal position, so that, when the lock travels forward and the sear is depressed, the nose of the trigger and bent of the tumbler engage, thus holding the firing pin to the rear.

Method of instruction.

To prepare the gun.
As for firing action—first shot.
Demonstration.
Using gun and cut lock.

Explanation.
Using gun and cut lock.
(1) Trigger lever returned to its normal position when pressure on finger trigger is released.
(2) Depression of sear.
(3) Nose of trigger and bent of tumbler.
Interrogation.

xv. *Action of the loading catch.*

(*a*) Pass the tag of the belt through the feed block and pull the belt until the first round is held by the retaining pawls.

(*b*) Pull downwards on the chain. This action moves the toe-piece of the loading catch into the path of the tail of the crank handle.

(*c*) Maintaining the pull on the chain, draw back the crank handle. The tail of the crank handle coming into contact with the toe of the loading catch causes the recoiling portions to be withdrawn, thus causing the slide to move outwards and the feed pawls to engage behind the round held by the retaining pawls. The tail of the crank handle slipping over the toe piece allows the recoiling portions, owing to the action of the fuzee spring, to move forward. The slide moving inwards carries the round held by the feed pawls into position in the feed block.

(*d*) Release the crank handle. The first cartridge will then be gripped by the extractor.

(*e*) Repeat as in (*c*) and (*d*) and release the chain. The extractor will now be gripping the first round, which is in the

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chamber, and the second round, which is in the feed block, between the upper and lower projection of the gib.

Method of instruction.

To prepare the gun.

Fire the lock and open the rear cover.

Demonstration.

Load, using the loading catch.

Explanation.

(1) Tag of belt.
(2) First round held by the retaining pawls.
(3) Chain pulled.
(4) Crank handle pulled back.
(5) Action of loading catch.
(6) Crank handle released.
(7) Repetition.
(8) Rounds held by extractor.

Interrogation.

xvi. *Loading and firing action, single shots.*

(*a*) *To load—single shots.*

(1) Pass the tag of the belt through the feed block.
(2) Pull the crank handle on to the roller.
(3) Pull the belt to the left or right front according to the feed block fitted.
(4) Release the crank handle. The first cartridge will be gripped by the extractor.
(5) Pull the crank handle back on to the roller and release it, without pulling the belt. This action withdraws the round from the feed block and places it in the chamber. The next round in the belt is held in position by the retaining pawls, but is not gripped by the extractor.

(*b*) *Action of loading catch.*

(1) Pass the tag of the belt through the feed block, until the first round is held by the retaining pawls.
(2) Pull downwards on the loading catch chain and pull the crank handle back on to the roller.
(3) Release the crank handle and the loading catch chain. The first cartridge will be gripped by the extractor.
(4) As for (5) above.

NOTE.—As the round is fired, the cartridge, held by the retaining pawls, is fed into the feed block and gripped by the extractor. Therefore, as each round is fired, it is necessary to pull the crank handle back on to the roller and release it.

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Method of instruction.

To prepare the gun.

Fire the lock and open the rear cover.

Demonstration.

Single shot load.

This lesson will be conducted in the form of interrogation.

(*c*) *Mechanism to fire single shots.*

Method of instruction.

To prepare the gun.

Remove the outer casing and the front and rear cups of the muzzle attachment, load the gun with an empty case in the chamber gripped by the extractor, and a dummy cartridge held by the retaining pawls. Remove the fuzee spring and box, open the front and rear covers. (The lock is left cocked to simplify the demonstration.)

Demonstration.

As for backward rotation of the crank; returning the crank handle to the check lever.

Explanation.

In the form of interrogation on the whole cycle of operations.

xvii. *Safety devices.*

(*a*) The breech is definitely locked and the cartridge rigidly supported in the following manner until the bullet has left the barrel.

In the firing position, the axis of the crank pin is slightly below a straight line drawn through the centre of the side lever axis pin and the crankshaft. The webs of the crank also rest on the crank stops.

The shock of discharge received by the lock is transmitted through the axis of the side levers and crank pin to the crankshaft, the latter being rigidly supported, relative to the barrel. As the crank pin is below the centre line, it tends to be forced downwards, but is prevented from doing so by the webs of the crank resting on the crank stops.

The small space between the tail of the crank handle and roller allows the whole of the recoiling portions to remain locked together and move backwards as one, until the breech is ready to be opened.

At the correct moment for unlocking, the crank is caused to rotate by the tail of the crank handle bearing on the roller, thus breaking the toggle joint.

(*b*) The cap cannot be struck by the firing pin until the breech is closed and the gun ready to fire.

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The firing pin is held to the rear by the sear until the latter is disengaged by the side lever head going below the horizontal after the lock is home and the breech is closed.

The firing pin is either held back by the engagement of the nose of the trigger and bent of the tumbler, until the trigger is pulled back, or propelled forward when the gun is firing.

(*c*) When the gun is firing, the webs of the crank strike against the crank stops and, at the same time, the firing pin is propelled forward. It would therefore be possible for the webs of the crank to rebound from the crank stops and cause premature opening of the breech, but rebound is prevented by the action of the check lever on the crank handle.

Method of instruction.

This lesson will be conducted, as far as possible, by interrogation.

3. Method of instruction.

i. *Object.*—As for 3-pr. Pamphlet No. 1.

ii. *Equipment required.*

(*a*) Gun (with D.P. lock if available) and mounting.
(*b*) Belt, belt box and dummy cartridges.
(*c*) Empty case (dummy without bullet).
(*d*) Spare lock and feed block.
(*e*) Cut gun and cut lock.
(*f*) Spare parts.
(*g*) Instructional diagrams.

iii. *Sequence of instruction.*

The following is the sequence in which instruction in mechanism will be given. Each stage should be thoroughly understood before the next is begun. The method of instruction is set out for each stage.

(*a*) To load.
(*b*) To fire.
(*c*) To unload.
(*d*) Action on recoil.
(*e*) First action in the feed block. (Left and right hand.)
(*f*) Backward rotation of the crank.
(*g*) Second action in the feed block.
(*h*) Backward movement of the lock.
(*i*) Cocking action of the lock.
(*j*) Action of the fuzee spring.
(*k*) Forward movement of the lock.
(*l*) Firing action—First shot.
(*m*) Firing action—Subsequent shots.
(*n*) Action inside the lock when pressure on the finger trigger is released.

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(*o*) Action of the loading catch.
(*p*) Loading and firing single shots.
(i) To load single shots.
(ii) Action of the loading catch.
(iii) Mechanism to fire, single shots.
(*q*) Safety devices.

5. STOPPAGES

1. General remarks.

When fired from an armoured fighting vehicle, the machine gun is a one-man weapon. Further, owing to the fact that targets may often be fleeting, the correction of stoppages with a view to the resumption of fire at the earliest possible moment is of paramount importance. These considerations combine to necessitate a system of immediate action differing in some respects from that laid down for other arms equipped with similar weapons.

Accuracy, when curing stoppages, is essential, and must not be sacrificed for speed. Faulty manipulation will often put the gun out of action for a considerable length of time.

Stoppages in the automatic action of the gun may be classed under two main headings :—

i. *Temporary.*—Due to—
(*a*) Failure of some part of the gun, a spare for which is carried.
(*b*) Faulty ammunition.
(*c*) Neglect of points before or during firing and the inspection of armament.
(*d*) Faulty manipulation.

ii. *Prolonged.*—Due to—
(*a*) Failure of some part which cannot be put right for a prolonged period.
(*b*) Faulty application of I.A. by the firer.

The table of temporary stoppages is designed for instructional purposes, being a practical means of training the soldier in the application of immediate action necessary to keep the gun in action and to prevent a possible recurrence of the stoppage. The table also indicates the instructional methods employed in teaching immediate action either in the class room or on the range.

Column. 1.—Deals with the position of the crank handle. In the first three positions the crank handle varies slightly, but the immediate action to be performed is clearly indicated; therefore it is important that the gunner should instinctively be able to recognize the position in which the crank handle stops.

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Column 2.—Shows the sequence in which the immediate action is applied.

Column 3.—Gives the probable cause of these stoppages, but as a rule causes should not be dealt with until the immediate action can be performed instinctively.

Column 4.—Shows the probable action to be employed by the gunner in order to prevent a recurrence of the stoppage.

Column 5 *and* 6.—Show how the various stoppages cured by immediate action can be simulated for instructional purposes. Every instructor must have a complete knowledge of the detail given in this table in order to teach the correct immediate action for any temporary stoppage.

2. Remarks on the table of temporary stoppages cured by immediate action.

i. *No.* 1 *Position.*—As a general rule the recoiling portions are forward, with the exception of the lock, which has not travelled back far enough to allow the extractor to drop. The horns of the extractor may be engaged with the steps on the solid cams, or with the plunger of the safety stop, or the tip of the bullet of the cartridge on the extractor may not be quite clear of the feed block; feed being practically complete, the action of pulling back the crank handle and releasing it completes the feed, with the result that the gun is ready for firing.

The probable cause of the stoppage is a weak charge. A recurring No. 1 is generally caused by "overloading" the recoiling portions, *e.g.* tight packings, tight pockets, etc., but may also be caused by a worn barrel or the outer casing of the muzzle attachment falling off, so reducing the forces that drive the recoiling portions to the rear. The lightening of the fuzee spring reduces the load to be overcome by the recoiling portions.

ii. *No.* 2 *Position.* The cycle of operations is practically complete, with the exception of the lock, which is prevented by some obstruction to the cartridge from going right home; therefore, when the obstruction has been removed and the gun loaded, firing may be resumed.

If the obstruction is a separated case, it may be caused by a faulty case or a short connecting rod. The firing of the cartridge in these circumstances allows undue expansion of the cartridge case, with the result that on extraction a portion of the empty case is left in the chamber.

In the event of a series of separated cases occurring, the lock will be changed; if this does not prevent a recurrence of the stoppage, the lock will be removed and a No. 1 and a No. 2 washer placed on the connecting rod.

iii. *No.* 3 *Position.*—This stoppage should rarely occur,

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if the points for the inspection of ammunition before firing are correctly carried out.

If the pockets of the belt are loose, vibration caused by the movement of the armoured fighting vehicle may loosen the rounds, resulting in a slight or bad cross feed.

A large percentage of slight cross feeds are caused during the action of loading.

Faulty application of immediate action for a slight cross feed may result in the stoppage having to be cleared in a manner similar to that of a stoppage caused by a thick rim cartridge. In the later stages of training it should be explained to the gunner that, when rectifying a thick rim stoppage, he should examine the position of the cartridge in the feed block. If it is found to be correctly fed up, act as for thick rim, but if it is incorrectly fed up, hang the lock, remove the first round from belt, re-load and resume firing.

Stoppages occurring when the feed is complete, the crank handle going down on to the check lever when a slight tap is given to it, are due to friction on the working parts. This cause may be practically eliminated by frequent oiling of the working parts when an opportunity permits.

The method of remedying a bad fault in feed stoppage is dealt with in the immediate action table, but, when a loading catch is fitted to the gun, the following method may also be employed to withdraw the recoiling portions and free the slide :—

(*a*) Pull down on the chain actuating loading catch, and pull the crank handle to the rear until the tail of the crank handle is against the loading catch.
(*b*) Place the fingers of the left hand on to the feed pawls.
(*c*) Press down on the pawls, and at the same time pull the crank handle slightly back. This action causes the recoiling portions to be withdrawn slightly and allows the pawls to be released.
(*d*) Hang the lock ; remove the belt from the feed block, attending to points laid down in the immediate action table.

Stoppages due to thick rim cartridges are rare, but may be more frequent in time of war. Similarly stoppages caused by damaged extractor grooves or defective gib or spring are not of frequent occurrence. The damage to the extractor may act in such a manner as to prevent it from rising fully, even when the normal I.A. for No. 3 has been applied. It is then necessary to force down the extractor in order to withdraw the lock.

If, when the extractor rises, the extractor detent is not forced into its seating correctly, but jams on the base of the cartridge in the ejection tube, a No. 3 stoppage may occur, the indication being similar to that caused by a thick rim cartridge.

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No. 4 Position.—Stoppages occurring with the crank handle in this position are caused by the fact that the cap is not struck, not sufficiently penetrated, or if an explosion does occur, the forces generated are not sufficient to cause the cycle of operations to take place, the lock remaining in the forward position. The probable faults are—defective lock spring or firing pin, very weak charge—missfires, or a space in belt.

3. Remarks on the table of prolonged stoppages not included in the I.A. table.

The causes of prolonged stoppages are so varied that full detail cannot be given. A table showing the more frequent of prolonged stoppages however is given. It is only by having a full mechanical knowledge of the gun that the cause of a prolonged stoppage can be traced.

Instruction in special stoppages should be dealt with as far as possible by interrogation.

i. *Ejection tube cartridge check.*—If defective, or completely missing, a stoppage rarely occurs during the firing of the gun. In the event of a stoppage occurring, the position of the crank handle depends on the position of the obstruction that has slipped from the ejection tube into the breech casing.

The crank handle may stop in a position slightly forward of a No. 1 position; varying to a position between the vertical and the roller.

ii. *Extractor detent.*—Similar to the above, a stoppage rarely occurs during firing, but, in the event of a stoppage, the crank handle will be in a position similar to that described above. This stoppage occurs more frequently during the unloading of the gun, when there are live rounds on the face of the extractor.

iii. *Weak or broken gib spring.*—The crank handle for this particular stoppage is usually in the No. 1 position. It is caused by the cartridge on the face of the extractor, which is normally held by the gib, sliding down out of engagement, so that, when the lock travels forward, the tip of the bullet fouls the face of the barrel block.

iv. *Fuzee or spring.*—If these are defective, there is nothing to rotate the crank forward, with the result that the crank handle and lock remain at the rear, but the recoiling portions, owing to the action of the crank handle on the roller, are forward; therefore feed is complete. Care must be taken in returning the crank handle to the check lever not to disturb the recoiling portions.

v. "*Run-away gun*".—The probable causes are:—

(*a*) The short arm of the lock spring being broken in a

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certain position, its action of forcing the nose of the trigger into engagement with the bent of the tumbler is reversed; thus, when the sear is depressed, the nose of trigger and bent of tumbler will not engage. This allows the lock spring to propel the firing pin forward on to the cap, so exploding the charge.

The nose of the trigger being worn or broken will give the same result as described above.

(*b*) Incorrect adjustment of the firing mechanism, *i.e.* the actuating arm is bearing too hard on the trigger, with the result that, when the change-lever is moved to ·303-in., the horizontal arm passing over the 3-pr. gun is moved to the left, thus causing the actuating arm to force the trigger of the coaxial gun to the rear, firing the gun; or the nose of the trigger, owing to the action of the horizontal arm, is only slightly engaged with the bent of the tumbler, with the result that the vibration of loading, etc., causes the nose of the trigger to disengage from the bent of the tumbler, so allowing the gun to fire; similarly the vibration caused by firing will not allow the nose of the trigger and the bent of the tumbler to engage when pressure is released from the firing handle.

NOTE.—The expression "Run-away gun" is intended to convey the fact that the gun fires when the crank handle is released for the second time on loading, or the change-lever is moved to ·303-in., or that the gun will not stop firing when pressure has been released from the trigger or firing handle.

vi. *Feed block.*—Broken bottom or top lever, retaining or feed pawls, all give the same indication, *i.e.*, after immediate action for a 4th position stoppage is applied, the gun fires two rounds and stops.

vii. *Roller.*—If this breaks, or works off, during the firing of the gun, the tail of the crank handle, as the recoiling portions move backwards, fouls the axis of the roller, thus causing partial rotation of the crank; complete action of the crank handle, which normally takes place during the backward movement, is prevented by the tail of the crank handle fouling the head of the rear cross-piece axis pin.

The backward movement of the recoiling portions is sufficient to move the slide, thus permitting the feed pawls to engage the cartridge held by the retaining pawls.

As a general rule the crank handle will appear to be in the 4th position, but is not right home owing to the recoiling portions not being right forward. The action of pulling the crank handle back on to the roller to clear the stoppage clears the round which is on the extractor from the feed block and allows the slide and feed pawls to carry the next round into position in the feed block and the recoiling portions to complete the forward movement.

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viii. *Missfire.*—In the event of missfires occurring, a cure may be effected by changing the lock. If missfires still occur, place a No. I and a No. 2 washer over the connecting rod.

ix. *Full deflector bag or tray.*—This may cause a jam in the ejection tube, resulting in a No. 1 position stoppage. There is danger of an explosion in the ejection tube should the jam occur when the gun is being unloaded.

4. Method of instruction.

i. *General instructional notes.*—The application of immediate action is based on the position of the crank handle, which may stop in one of four positions, known as the first, second, third and fourth position. The position of the crank handle denotes the particular immediate action to be applied for remedying the stoppage.

A target will always be used, and will always be indicated by a fire order. Immediate action is not complete until the gun has been relayed and fired.

After immediate action has been completed, the aim should be checked and criticised. The immediate action as performed by the gunner should be criticised by the squad, the instructor making a correct criticism after the squad has been interrogated.

The squad will be seated near to the right side of the gun, so that the crank handle may be visible, and the actions of the gunner more plainly seen.

While the stoppage is being set up, the gunner should be in a position behind the gun (mounted or dismounted) with his head turned aside. The instructor will on completion of the setting up, order "Mount", or, if already in position behind the gun, "Alert"; the gunner then assumes the correct firing position.

NOTE.—The crank handle will always be covered up when immediate action is being practised.

Careful handling of the gun and accessories, as emphasised in stripping, must be borne in mind.

To avoid damage to the extractor, thick rim cartridges will not be used. A dummy cartridge bulged near the base serves the same purpose.

Causes of stoppages should not be dealt with while a class is being taught or exercised in immediate action, but may be dealt with in a special lesson, or explained briefly at the end of a lesson.

Instructors must bear in mind that *immediate action is a form of drill which subsequently becomes instinctive*, and it is for this reason that every gunner must learn to apply the correct I.A. without thinking about the cause of the stoppage.

Setting up stoppages will not be taught to the private soldier, unless he is being trained to become an instructor.

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ii. *Equipment required.*

(*a*) Gun correctly mounted, complete with accessories.
(*b*) Belt box, belt and dummy cartridges.
(*c*) Damaged dummy cartridge (No. 2 stoppage).
(*d*) Two dummy cartridges bulged near the base. (Thick rim, etc.)
(*e*) Dummy cartridge, with the front portion of a separated case fixed on to it.
(*f*) Front and rear portions of a separated case.
(*g*) Empty case.
(*h*) Spare parts.
(*i*) Aiming mark.
(*j*) Covering for the crank handle.

iii. *Sequence of instruction.*

(*a*) *Preliminary explanation.*

(1) The gun will normally fire correctly and continuously, but, as a result of neglect or carelessness on the part of the gunner, defective ammunition or mechanism, the gun may stop firing.

The action to be taken by the gunner is based on the position of the crank handle and, as fire must be resumed as soon as possible, immediate action must become instinctive. It is only by continuous practice that this instinctive action can be achieved.

(2) Remove the fuzee spring and box and show the squad the four positions of the crank handle.

(*b*) The instructor will then—

(1) set up the gun for the first phase of No. 1;
(2) demonstrate and explain the immediate action;
(3) practice each member of the squad;
(4) interrogate if necessary.

When the squad is proficient, the sequence as set out above will be repeated for the first phase of No. 2, followed in a similar manner by the first phase of No. 3 and 4 respectively.

The first lesson on immediate action will be said to have been completed when the squad is proficient in immediate action with the crank handle covered for all the above phases.

(*c*) The second lesson of immediate action will begin with the teaching of the 2nd phase of No. 1 in the manner described in (*b*) (1), (2), (3), (4) above, followed by completing the remainder of the 2nd, 3rd and 4th positions respectively.

The rate of progress will depend on the ability of the instructor and of the squad. Each stage must be thoroughly understood before the next is begun. Continuous practice of the stoppages taught, with the crank handle covered, is necessary.

Practice in immediate action will also be given in a darkened room and also in respirators.

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5. Table of temporary stoppages cured by immediate action.

Position of crank handle (1)	Immediate action (2)	Probable cause (3)	Prevention of recurrence (4)	Method of preparation for instructional purposes	
				Mechanical instruction (5)	On the range (6)
No. 1. *Indication.*—The lock is unable to come back far enough to allow the extractor to drop.	i. Pull the crank handle back on to the roller; release crank handle. Re-lay and fire.	i. The extractor has not dropped. This may be due to a weak charge.		i. Perform the half loading motions; pull the crank handle slowly back until the lock is hung; pull the belt left front for right-hand feed block, right front for left-hand feed block.	i. Not set up.
	ii. If, after i. has been carried out, the gun fires a few rounds and stops again in the same position, apply the I.A. as for i, and lighten the fuzee spring by three half turns. If the stoppage recurs, repeat as for ii.	ii. (*a*) Succession of weak charges. (*b*) Too strong fuzee spring. (*c*) Excessive packings. (*d*) Tight pockets. (*e*) Lack of oil on the recoiling portions. (*f*) Grit or dirt on the recoiling portions. (*g*) Worn barrel.	ii. Attention to points before and during firing, and "Inspect Armament".	ii. Prepare the gun as for i; when the I.A. for i has been applied and the gun fired, pull the crank handle back until the lock is hung, pull the belt to the left or right front. During this time the instructor will say "Gun fires a few rounds and stops again in the same position."	ii. Put more weight on the fuzee spring.

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Position of crank handle (1)	Immediate action (2)	Probable cause (3)	Prevention of recurrence (4)	Method of preparation for instructional purposes	
				Mechanical instruction (5)	On the range (6)
		(*h*) Frozen water or cold oil. (*i*) Outer casing muzzle attachment fallen off.			
No. 2. *Indication.*—The lock is unable to go fully forward after recoil. 	i. Force the crank handle to the rear; open the rear cover, lift up the lock; keeping the extractor down, ease the crank handle forward on to the check lever and examine the empty case held by the extractor detent :— (*a*) If undamaged.—clear the face of the extractor, replace the lock in the gun, close the rear cover, release the crank handle, perform the half loading motions. Relay and fire.	(*a*) Damaged cartridge.		(*a*) Place on the extractor a damaged dummy cartridge, between the upper and lower projection of the gib, and an empty case so that it is held by the extractor detent; replace the lock in the	(*a*) Place a damaged dummy cartridge in the belt. (Not as the first round.)

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(b) If only a portion of the empty case is held by the extractor detent, and the unfired cartridge has the front portion of a separated case adhering to it, clear the face of the extractor, replace the lock in the gun, close the rear cover, release the crank handle, perform the half loading motion. Relay and fire.	(b) Separated case, the front portion of which is telescoped on the unfired cartridge.	(b) and (c) If a succession of separated cases occurs, the connecting rod must be lengthened. If a change of lock effects no improvement, remove the lock and place over the connecting rod a Nos. 1 and 2 washer. Replace the lock. NOTE.—On return to billets, report to the armourer, who will make a correct adjustment.	gun; close the rear cover; pull the belt to the left or right front; release the crank handle. (b) Place on the extractor a dummy cartridge to which is adhering the front portion of a separated case between the upper and lower projection of the gib, and the rear portion of a separated case so that it is held by the extractor detent; replace the lock in the gun; close the rear cover; pull the belt to the left or right front and ease the crank handle forward.	(b) and (c) Not set up.
(c) If only a portion of the empty case is held by the extractor detent and there is no separation on the unfired cartridge, clear the face of the extractor, replace the	(c) Separated case, the front portion remaining in the chamber.		(c) Place on the extractor a dummy cartridge, between the upper and lower projection of the gib, and the rear portion of a separated case so that it is held by the	

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Position of crank handle (1)	Immediate action (2)	Probable cause (3)	Prevention of recurrence (4)	Method of preparation for instructional purposes	
				Mechanical instruction (5)	On the range (6)
	lock in the gun, keeping the crank handle back on the roller, take the clearing plug, ensure that the centre pin is back and insert into the chamber; allow the lock to go slowly forward, keeping a firm pressure on the crank handle; which forces the centre pin right forward; give the clearing plug a rocking motion and withdraw the lock; strike back the handle of the clearing plug and withdraw it. Examine the clearing plug to ensure that the separation has been removed. Close the rear cover; release the crank handle; perform the half loading motions. Relay and fire.			extractor detent. Place the front portion of a separated case over the bullet of the dummy on the extractor; carefully replace the lock in the gun; allow the lock to go slowly forward, placing the separation in the chamber so that it remains there; slightly withdraw the lock to ensure that this is so; close the rear cover; pull the belt to the left or right front.	

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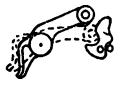
No. 3. *Indication.*—The extractor is unable to rise to its highest position. 	i. Slightly raise the crank handle; pull the belt to the left front for right-hand feed block and right front for left-hand feed block; release the crank handle and strike it down on to the check lever with a glancing blow of the hand. Relay and fire.	i. Cartridge is fed up slightly cross-ways.		i. Perform the half loading motions; then pull the crank handle on to the roller; open the rear cover, and pull the belt sufficiently to move a cartridge half way into the face of the feed block; allow the crank handle to go slowly forward, so that it will remain in the 3rd position; close the rear cover.	i. Not set up.
	ii. If after applying the I.A. as for i. the gun fires a few rounds and stops again in the same position, repeat the I.A.; unload; oil the working parts. Reload, relay and fire.	ii. Friction of the working parts.	ii. Attend to points during a temporary cessation of fire.	ii. Perform the half loading motions, then pull the crank handle back on to the roller and pull the belt to the left or right front; ease the crank handle forward so that it will remain in the 3rd position; when the I.A. has been completed and the gun fires, pull the crank handle back on to the roller and pull the belt; ease the crank handle forward so that it remains in the 3rd position. During this time the instructor will say,	ii. Not set up.

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Position of crank handle (1)	Immediate action (2)	Probable cause (3)	Prevention of recurrence (4)	Method of preparation for instructional purposes	
				Mechanical instruction (5)	On the range (6)
				"Gun fires a few rounds and stops again in the same position."	
	iii. If the I.A. as for i. fails, feel the feed pawls; if tight (slide jammed), force the crank handle to the rear and open the rear cover; hang the lock; close the rear cover; withdraw the recoiling portions and depress the feed pawls; ease the recoiling portions forward; withdraw the belt from the feed block and examine it for :— (*a*) Loose rounds in belt. (*b*) Bent or damaged brass strips. (*c*) Torn belt. (*d*) Belt not in line with feed block. Rectify any fault discovered. Reload, relay and fire.	iii. (*a*) Loose pockets or badly filled belt. (*b*) Bent or damaged brass strips. (*c*) Torn belt. (*d*) Belt not in line with the feed block.	iii. Attend to points before and during firing, and "Inspect Armament".	iii. Pull out the fourth cartridge in the belt about half an inch; perform the half loading motions; pull the crank handle back until the lock is hung; withdraw the recoiling portions and pull the belt to the left or right front; ease the recoiling portions forward as far as they will go; bring the crank handle back on to the roller and ease forward.	iii. Not set up.

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iv. If the I.A. as for i. fails, feel the feed pawls: if loose, open the front cover, rest the handle of the clearing plug on top of the extractor and force down, at the same time pulling the crank handle on to the roller, close the front cover and lift out the lock, clear the face of the extractor and hang the lock, close the rear cover, withdraw the belt from the feed block and remove the first round from the belt. Reload, relay and fire. v. If after carrying out iv. above, and on reloading, the stoppage recurs, repeat the I.A. as in iv. except that, when the extractor has been cleared, change the lock. NOTE.—It is not necessary to remove the first cartridge from the belt.	iv. (*a*) Fault in feed when loading in an A.F.V. (*b*) Thick rim cartridge. v. (*a*) Damaged extractor grooves. (*b*) Defective gib or spring.	iv. Place on the extractor a dummy cartridge bulged at the base, between the upper and lower projection of the gib. Close the rear cover and pull the belt, ease the crank handle forward. v. Place on the extractor a dummy cartridge bulged at the base, between the upper and lower projection of the gib. Hang the lock and close the rear cover. In the belt place one dummy cartridge bulged at the base as the second round in belt; pull the belt, ease the crank handle forward.	iv. Place in the belt a dummy cartridge bulged at the base followed by a good dummy cartridge. v. Place in the belt three dummy cartridges:— First—bulged at base. Second—good dummy. Third—bulged at base.

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Position of crank handle (1)	Immediate action (2)	Probable cause (3)	Prevention of recurrence (4)	Method of preparation for instructional purposes	
				Mechanical instruction (5)	On the range (6)
No. 4. *Indication.*—There has been no explosion, or, if there has, little or no recoil has taken place	i. Reload, relay and fire.	i. (*a*) Defective ammunition. (*b*) Space in belt.	i. (*b*) Inspect the belt.	i. (*a*) Load and fire the gun. (*b*) Unload the gun and fire the lock; insert the belt in the feed block until the first round in the belt is in line with the finger piece of the retaining pawls.	i. (*a*) Insert two dummies in the belt. (*b*) Leave a space in the belt.
	ii. If after applying the I.A. as in i. the gun does not fire, unload and change the lock. Reload, relay and fire.	ii. (*a*) Weak or broken lock spring. (*b*) Worn or broken firing pin.		ii. When the I.A. as in i. has been completed and the gun fired, the instructor will say "Gun will not fire."	ii. Insert four dummies in the belt.

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6. Table of prolonged stoppages.

Probable position of the crank handle.	Action by the gunner.	Probable cause	Method of preparation for mechanical instruction
The position of the crank handle varies; it may stop slightly forward of the No. 1 position to between the vertical position and the roller.	i. If after applying the I.A. for the 1st position i. the crank handle stops in the same position when going forward, pull the crank handle on to the roller, open the rear cover, lift out the lock; keeping the lock back and the extractor down, ease the crank handle on to the check lever and examine the position of the unfired cartridge and the empty case on the face of the extractor:—		
	(*a*) If the unfired cartridge is not held correctly by the gib, but has slipped out of engagement, clear the face of the extractor, change the lock. Reload, relay and fire.	i. (*a*) Weak or broken gib spring.	i. (*a*) Place a dummy cartridge on the extractor, half-way down the lower projection of the gib, (so that the bullet will foul the face of the barrel below the chamber), and an empty case so that it is held by the detent. Replace the lock in the gun, close the rear cover, ease the crank handle forward and pull the belt.
	(*b*) If the gib is functioning correctly, examine the extractor detent. If faulty, the empty case will either have fallen into the breech casing or be on the lower part of the extractor, but not held correctly. Clear the face of the extractor, examine and clear the inside of the	(*b*) Defective extractor detent.	(*b*) Place a dummy cartridge on the face of the extractor between the upper and lower projection of the gib; place an empty case in the breech casing so that the extractor cannot drop and the horns of the extractor foul the under part of the solid cams. Replace the lock in the

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Probable position of the crank handle.	Action by the gunner.	Probable cause	Method of preparation for mechanical instruction
	breech casing of obstructions, change the lock. Reload, relay and fire. NOTE.—This stoppage may also occur during the unloading of the gun when there are live rounds on the extractor. (*c*) If the gib and extractor detent are correct, clear the face of the extractor; examine and clear the inside of the breech casing of obstructions. Reload, relay and fire. NOTE.—The trigger guard may be lowered to assist in clearing the breech casing of obstructions.	(*c*) Defective cartridge check in the ejection tube.	gun, close the rear cover and pull the belt. If the stoppage is supposed to occur when the gun is being unloaded and there are unfired rounds on the extractor, a good dummy will be placed in the breech casing instead of an empty case. (*c*) Place a dummy cartridge on the face of the extractor, between the upper and lower projection of the gib, and an empty case held by the detent. Place an empty case in the breech casing so that the extractor cannot drop, and an empty case about to enter the ejection tube. Replace the lock in the gun, close the rear cover and pull the belt.
The crank handle is right back on the roller.	Return the crank handle to the check lever. Remove the fuzee spring box, spring and fuzee. Replace the defective part. Relay and fire.	Broken fuzee spring or fuzee.	Place a dummy cartridge on the face of the extractor, between the upper and lower projection of the gib, and an empty case so that it is held by the detent. Remove the fuzee spring box and detach the fuzee chain. Replace the fuzee spring box, pull the belt, replace the lock in the gun so that the crank handle remains on the roller. Close the rear cover.
i. The gun fires when the crank handle	i. *For M.Gs. mounted co-axially with the 3-pr.*—	i. (*a*) Incorrect adjustment of the co-	i. The firing mechanism is adjusted so that the M.G. will fire when the

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touches the check lever the second time on loading.

ii. The gun will not stop when pressure is released from the firing mechanism.

iii. The gun fires when the change lever is moved to co-ax.

iv. The gun fires when the change lever is at 3-pr.

Immediately it is discovered that the gun is firing out of control, the change lever will be moved to 3-pr. and the unused portion of the belt nearest the mouth of the feed block lifted up. The probable stoppage occurring may be a No. 4 or a No. 3 position.

Should a No. 4 position stoppage occur.—Withdraw the belt from the feed block until the first round is clear; unload the gun.

If a No. 3 position stoppage occurs, hang the lock; it may be necessary to force the extractor down in order to do this. If the slide is jammed, withdraw the recoiling portions as for bad fault in feed. Withdraw the belt from the feed block until the first round is clear. Pull the crank handle back on to the roller and release it, so firing the round that may be on the extractor. Unload the gun. Remove the lock and test it. If the nose of the trigger and bent of the tumbler do not engage when the sear is depressed, change the lock, replace in the gun, reload, relay and fire. If the lock is found to be correct, the co-ax. firing mechanism must be examined and re-adjusted. Should this fault occur in action, a temporary remedy may be effected by slackening the adjusting sleeve of the firing gear.

ax. firing mechanism.

(*b*) Short arm of the lock spring broken.

(*c*) Worn or broken nose of trigger or bent of tumbler.

change-lever is moved to co-ax., or when the crank handle touches the check lever the second time on loading, by screwing up the adjusting sleeve of the co-ax. firing mechanism; or, if it is intended to simulate a defective lock, insert a piece of stiff paper between the tail of the trigger and lock spring, so that the firing pin will go forward when the sear is depressed. The instructor will order "3-pr. and co-ax.—action" and give a fire order for 3-pr.; when two or three rounds have been fired, order "3-pr. stop"—"Co-ax.". The gunner should then move the lever to co-ax; immediately the change is effected, say "Gun firing"; *or*, with the change-lever set at co-ax., order "Co-ax.-action"; when the crank handle touches the check lever the second time, say "Gun firing"; *or*, when a target is being engaged with the co-ax. gun, the instructor orders "Stop"; immediately pressure is released from the firing mechanism, say "Gun still firing".

NOTE.—Prepare the gun for either stoppage, No. 4 position as for space in belt, No. 3 position as for slight or bad cross feed.

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Probable position of the crank handle.	Action by the gunner.	Probable cause.	Method of preparation for mechanical instruction
	Peace training.— Notes.—1. Crew commanders will ensure that all guns are clear if the tank is halted to carry out an adjustment to the co-ax. firing gear. Guns will not be reloaded without orders from the crew commander. 2. It is of no consequence which member of the crew stops the gun firing; any delay may lead to serious results.		
The gun fires when the crank handle reaches the check lever the second time on loading.	ii. *For M.Gs. not co-axially mounted.*— Lift up the unused portion of the belt, nearest the mouth of the feed block. The probable stoppage occurring may be a No. 4 or No. 3 position. The method of clearing either stoppage will be as described for the co-ax. gun, except that the lock will be immediately changed without testing, and the gun reloaded, relayed and fired.		ii. Set up any of the stoppages that may occur, cover the crank handle, and give a fire order; when the gun is firing, order "Stop"; when pressure is released from the trigger, say "Gun still firing"; when the belt has been raised to stop the gun, pull off the cloth, which indicates that the gun has stopped, the stoppage being indicated by the position of the crank handle; *or* order "action"; when the crank handle reaches the check lever for the second time on loading, say "Gun firing".
The lock remains in the forward position, the crank handle on the check lever.	i. If missfires are experienced, unload and change the lock. If missfires still occur, unload, remove the lock, place over the connecting rod	i. Short connecting rod. NOTE.—On return to billets, report to	i. When the I.A. for the 4th position has been applied and the trigger pressed, say "Gun stops" and repeat after each application of I.A.

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	a No. 1 and a No. 2 washer, replace the lock, reload, relay and fire. ii. If after applying the I.A. for the fourth position i. the gun fires two rounds and stops again in the same position, unload, remove the belt and change the feed block, reload, relay and fire.	the armourer, who will make the necessary adjustments. ii. Broken bottom or top lever of feed block, retaining or feed pawls.	until the lock is changed or washers put on the connecting rod, or say, "The gun gives missfires." ii. When the I.A. for the 4th position i., has been applied and the trigger pressed, say "Gun fires two rounds and stops again in the same position."
The crank handle appears to be in the 4th position, but is not right forward on the check lever.	If after applying the I.A. for the fourth position i. the gun fires *one* round and stops again in the same position, pull the crank handle back on to the roller and release it. Examine the pin fixing collar roller, collar and roller, remedy the defect, relay and fire.	Defective pin fixing collar roller, collar or roller.	Load the gun with an empty case in the chamber and a dummy cartridge in the feed block. Remove the collar and roller, and fire the lock. Raise the crank handle until level with the rear cover, and pull the recoiling portions to the rear, ease the recoiling portions forward and push the crank handle down. When the I.A. for the 4th position i., has been applied and the trigger pressed, withdraw the recoiling portions as described above, and say "Gun fires one round and stops in the same position."

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6. BELT FILLING

1. This lesson should be done practically with good belts and S.A.A., and may conveniently be conducted concurrently with belt filling for range work. Correct belt filling is essential.

2. The correct method of holding the belt when inserting a cartridge is :—

i. Belt in left hand, back of hand to the left, tag and lower strips to the left, forefinger and second finger on opposite sides of the belt.

ii. Open the pockets of the belt by squeezing the hand.

iii. Insert the round in the correct position, *i.e.* with the tip of the bullet in line with the end of the long brass strip.

7. MAINTENANCE—GUNNERY

1. Object.

As for 3-pr. Pamphlet No. 1.

2. Responsibility.

As for 3-pr. Pamphlet No. 1.

3. Materials supplied for cleaning.

Description of material (1)	Each machine gun and mounting annually	
	For guns in use (2)	For guns in store (3)
Mineral jelly, red	—	1½ lb.
Dubbin	½ lb.	—
Flannelette	20 yds.*	6 yds.
Linen or cotton, old	—	3 lb.
Oil, mineral burning	½ pt.	—
Oil, M.80	8 pts.	—

* 20 yds. allowed for regular cavalry, infantry and the Royal Tank Corps—authority, Equipment Regulations, Part I.

A mixture of 50 per cent. mineral jelly and 50 per cent. M.80 (by weight) is of great value for preventing the exterior of machine gun barrels from rusting in the field, and, if obtainable, should be regularly used.

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The following will be allowed to each store in which machine guns are kept, or dealt with, and will be replaced if necessary :—

Flannelette (old blanket is very effective). 1 sq. yd.
Rod twisted copper wire, Mark I.
(Authority—Equipment Regulations, Part I.)

4. Special remarks.

i. *General points.*

The following points will be explained to the crew, the reason and object being given :—

(*a*) Daily examination and care of M.Gs. after firing.
(*b*) Protection from sand, etc.
(*c*) Correct assembly of muzzle attachment.
(*d*) Preservation of the browning on surfaces.
(*e*) Observations of all points laid down for stripping.

ii. *For guns in store.*

Where guns are to be stored for long periods or packed for transmission, the unpainted surfaces of steel of machine guns, spare parts and tools will be covered with a thin coating of a mixture consisting of equal parts, by weight, of red mineral jelly and oil M.80. Thick coatings must not be applied owing to the difficulty of removal.

For the bore the lubricant will be heated as necessary, until it becomes thin, and then applied by means of a strip of flannelette well saturated with the lubricant and inserted in the eye of the twisted copper rod.

The rod will be drawn through from the breech and muzzle end ; the flannelette should fit tightly in the bore.

The exterior will also be coated with the lubricant in a cooler condition.

The barrel casing and steam tube of Vickers machine guns must be quite free from water and the screwed plugs removed to prevent condensation on the barrel. The asbestos packing should be dried and oiled to prevent it from rusting the barrel and its bearings.

iii. *Wear in the bore.*

This is due to three causes :—

(*a*) The friction of the bullet.
(*b*) The heat generated when ammunition is fired.
(*c*) The friction of the pull-through and gauze when the bore is being cleaned.

As regards (*a*) and (*b*) wear is unavoidable. Undue wear may be caused by improper and unnecessary use of the pull-through and gauze. It is essential that instructions for cleaning be rigidly adhered to.

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iv. *High polish of the bore.*

The highly polished surface of the bore, when new, minimises the tendency to rust and to collect metallic fouling. As the bore becomes worn, the polish diminishes and greater care is necessary to prevent the formation of rust. No means of cleaning the barrel will be employed other than that given in instructions for cleaning.

v. *Fouling.*

There are three kinds of fouling :—

(*a*) Superficial.—The waste products of the propellant charge, and the cap composition remaining on the surface of the bore.

(*b*) Internal.—Caused by some of the products of combustion being forced into the pores of the metal.

(*c*) Metallic or nickelling.—Caused by a portion of the cupro nickel of the envelope being left on the surface of the bore, and appearing as a bright streak on the lands, or as a roughness on the edges of the grooves.

Neglect in either of the first two cases (*a*) and (*b*) will result in the formation of rust, necessitating excessive use of the wire gauze, or even more drastic treatment, to remove the rust.

Internal fouling is present in any barrel through which rounds have been fired, and is not immediately discernible. This fouling, in the course of time, will eventually be forced from the pores of the metal and forms a hard black crust of fouling on the surface of the barrel.

The bulk of internal fouling can be removed after firing by the use of boiling water.

If circumstances do not permit the use of boiling water, the barrel must be repeatedly dry cleaned and re-oiled, the cleaning rod and flannelette being used. This method will eventually remove the fouling and prevent it from forming on the surface of the bore.

Superficial fouling is readily removed when warm by the use of a cleaning rod and flannelette, but, if it is allowed to remain for long periods in the barrel, it will become hard and have an effect similar to that produced by internal fouling.

Metallic fouling (nickelling). The barrel should be carefully watched for the appearance of this fouling. If deposited near the muzzle or breech, it is visible when the bore is cleaned, but, if in the centre of the bore, it can only be detected by the use of a gauge plug. It is a cause of inaccurate shooting, and, if a gun for no apparent reason shoots badly, its presence should be looked for as a possible explanation. The double pull-through and gauze will be used to remove this fouling.

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vi. *Sandy countries.*

Great care is necessary in the quantity of oil used. A thin film of oil will prevent the formation of rust and also be sufficient lubricant for the gun when firing.

vii. *In frosty weather.*

Oil the mechanism very slightly. Keep the friction of the recoiling portions very low, *i.e.* between two or three pounds, and adjust the weight of the fuzee spring to about seven pounds. Extra weight may be placed on the fuzee spring when the gun has warmed up.

viii. *Telescopes.*

The telescope when issued is in the correct adjustment, watertight, and with all its cells secured by fixing screws. It must on no account be taken apart, except by a person holding a certificate from the Military College of Science stating that he is competent to do so.

ix. *Precautions to be taken against gas.*

The best protection is to keep all metal surfaces well oiled. After being exposed to gas, the gun should be cleaned by wiping the affected parts with waste soaked in paraffin or petrol. Final swabbing with clean soaked waste should then be carried out, the swabs being finally burnt. Re-oil the gun.

All traces of gas must be removed from the ammunition with a lightly oiled rag. Then thoroughly dry clean the ammunition.

5. Care and preservation of telescopes.

The exterior metal surfaces must be kept clean with a soft cloth. If they are very dirty, a little paraffin or turpentine may be used, which must afterwards be rubbed off. The exterior of the lenses should only be lightly rubbed, when being cleaned, with a piece of soft, clean linen, used for this purpose only. No oil or grease should be allowed to get on the lenses, nor should they be touched with the fingers.

Telescopes should be kept in a dry place, especially in tropical climates, where a film is apt to form on the lenses.

When not in use, or being carried, the telescope should have the focusing gear right home, and should be kept in its case; any unnecessary shaking or jolting should be avoided.

Rubber eye-guards should not be exposed unnecessarily to extremes of temperature, to the sun's rays or to bright light. Oil or grease will inevitably destroy them, and prolonged contact with benzole, petrol or chemicals is undesirable. If, however, oil or grease appears, it should be removed either by wiping with a clean rag soaked in petrol or benzole; or by washing in water to which a little soap or soda has been

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added, finally well rinsing in clean water; or by wiping with a clean rag.

French chalk or even fine road dust is useful to absorb oil from rubber if none of the above methods of cleaning are available.

Spare eye-guards will be stored in a wooden box completely filled with french chalk and closed by a lid, so as to exclude air. The eye-guards must be stored in such a way that they are not distorted. If french chalk is not available, eye-guards should be kept under water. If, after being in store for some time, the eye-guards lose their pliability, they can generally be rendered supple, when required for use, by steeping them in hot water.

The case may be cleaned with any good leather preservative, or a little castor oil, which must, however, be wiped off again with a dry rag. When the telescope is in use, the case, etc., must be closed, to prevent dirt, etc. from entering.

6. To clean the barrel.

i. *Immediately after firing.*

Remove the lock from the gun. Place a piece of oiled flannelette, about 4 ins. by 2 ins., in the eye of the cleaning rod, taking care that the latter is surrounded by the flannelette. Insert the rod from the muzzle of the barrel and pass it up and down until the barrel is clean; replace the oiled flannelette with dry pieces. Inspect the bore and re-oil.

If the backward pull on the cleaning rod is hard, reverse the position of the flannelette from the breech end.

ii. *Cleaning after firing.*

As soon as possible after return to billets all fouling must be removed. An effective method of cleaning is the use of boiling water. Remove the barrel from the gun, and thoroughly dry clean; insert a funnel into the breech end of the barrel and pour through five or six pints of *boiling* water.

Boiling water causes the metal to expand, so loosening the fouling, making it easily removable.

The barrel must be thoroughly dry cleaned, and the bore examined for fouling in the lands and grooves. To examine the bore, hold the barrel up to the light and correctly focus, inspect carefully each groove and land, reverse the barrel and inspect from the other end. Where any defect such as a bulge, cut or deep scratch is suspected, the barrel must be examined by the armourer.

iii. *Subsequent care after firing.*

When the gun has been fired, daily cleaning of the barrel is necessary for at least ten days after firing, and every precaution should be taken to prevent the formation of rust.

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Subsequent cleaning beyond this period depends on atmospherical conditions, and therefore must be left to the discretion of the officer in charge. The bore at all times must be left coated with oil.

iv. *Cleaning D.P.B. barrels.*

The barrel should be kept clean in the chamber only. It is strictly forbidden to clean the bore in front of the bush, in view of the fact that the bush is driven in from the breech, and is liable to be driven backwards from its correct position by the application of the cleaning rod.

7. Use of gauze and double pull-through.

i. *To fit the wire gauze on to the double pull-through.*

Wire gauze is issued in pieces 2½ ins. by 1½ ins. for the removal of fouling that cannot be removed in the normal manner. To fit the gauze, turn the shorter sides towards the centre, so that the longer sides form an "S"; then coil each half of the gauze tightly round the portion of the cord over which it is placed, until the two rolls, thus formed, meet. As the object of the gauze is to scour out the grooves, it should therefore fit the bore tightly. When it fails to do so, as it will after having been in use for a while, it should be partially unrolled, and packed with flannelette to increase its bulk.

Before use, ensure that the gauze is clean and oiled. Cleaning with gauze entails wear of the bore, and should therefore be used under supervision. Difficulty in removing fouling will be reported. The surest way of preventing the necessity for the continued use of gauze is to keep the bore oiled so as to prevent rust.

A barrel which has become rusty will always be more difficult to clean than one that has been kept in good condition. Similarly a barrel which is showing signs of wear in the bore will require more care than one where the surface is not worn. The surface being rough, moisture is more likely to collect and rust to form. It is more difficult to remove rust from a roughened surface than a smooth one.

ii. *Method of using the double pull-through.*

Remove the barrel from the gun and dry clean, note the approximate position of the fouling to be removed, fit the muzzle protector (where one is provided) and, having thoroughly oiled the gauze, drop the brass weight of the pull-through through the bore from the breech end. Fix the barrel in a vice, taking care that it is not damaged; or have it firmly held; with a man at each end of the double pull-through, pull the cord backwards and forwards over the approximate position of the fouling in the barrel; great care

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must be exercised in preventing the cord from wearing the breech end of the barrel.

When signs of wear in the cord appear, a new cord will be taken into use. If the cord breaks in the bore, the barrel will be taken to the armourer. No attempt should be made by the gunner to remove the obstruction.

When the gauze becomes worn out, it should be replaced by one of the spare pieces which are issued with each double pull-through.

8. Daily cleaning.

Two methods of carrying out daily cleaning are described below. The method to be employed depends on local conditions.

i. *Gun.*

Remove from the mounting. Strip and thoroughly clean. Paraffin may be used to clean the mechanism, the parts being dry cleaned after its use. Slightly oil all metal surfaces. Very little oil should be used for this purpose, as it is apt to catch the dust and clog.

The barrel will be dry cleaned, inspected and slightly oiled, no oil other than oil M.80 being used. The function of the oil is to cover the surface of the bore with a waterproof film, thus preventing moisture forming on the steel and forming rust. The oil must be well worked into the flannelette with the fingers; otherwise it will be scraped off when entering the barrel.

NOTE.—Paraffin, although an excellent agent for removing rust, etc., does not prevent rust from forming; therefore all traces of paraffin will be removed and the metal surfaces oiled.

If circumstances do not permit the removal of the gun from the mounting, the working parts may be removed and cleaned; or dry clean as much of the outside of the gun as possible, and wipe all the mechanism with an oily rag. Clean, inspect and slightly oil the bore.

Remove the feed block, hang the lock and oil the bearing parts of the barrel.

To hang the lock, pull the crank handle slowly back until the left horn of the extractor is engaged behind the extractor safety stop, or the horns of the extractor drop into the steps on the rear face of the solid cams. The barrel and sideplates can now be moved backwards by placing the thumb behind the knob of the crank handle and the first two fingers on the tail of the crank handle and rotating it.

ii. *Mounting.*

Clean, wipe over with an oily rag, and ensure free working.

iii. *Sights.*

See notes on care and preservation of telescopes Sec. 7, 5.

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iv. *Spare parts and tools.*

Clean and re-oil. Oil cans will be kept filled.

9. Preparation for weekly inspection.

A thorough cleaning and overhaul will take place weekly, coinciding with an inspection. The method of laying out the parts will be in accordance with unit instructions, and the condition of the parts will be as laid down in the table in para. 12, iv. below.

After the inspection and weekly cleaning, parts will be restored to their normal state as described in the table.

10. Cleaning after firing.

As soon after firing as possible, the gun, mounting, sights, spare parts and ammunition will be restored to their normal state. For full particulars see "Points before, during and after firing".

11. Care of ammunition, belts and belt boxes.

i. *Ammunition.*

This must not be subject to extremes of temperature. It must be kept dry and clean, and, when in belts, must be examined daily and the rounds turned occasionally. Small particles of sand, grit, earth, etc., may adhere to the rim of the cartridge, or even the bullet, thus causing a stoppage or damaging the barrel.

Ammunition will not be oiled, unless it is stated so.

ii. *Belts.*

Belts will be frequently examined; they must be kept free from dirt, pockets not torn and brass strips not bent or broken. Belts will be kept dry and free from oil. New belts may have to be plugged, but discriminate use of the belt plug is essential.

iii. *Belt boxes.*

They must be frequently examined and be clean and not damaged; otherwise belts cannot be withdrawn freely. The outside of the boxes will be wiped periodically with a slightly oiled rag.

12. Method of instruction.

i. *Object.*

As for 3-pr. Pamphlet No. 1.

ii. *Responsibility.*

As for 3-pr. Pamphlet No. 1.

iii. *Equipment required.*

Gun, mounting, telescope, spare parts, spare barrel, belts, belt boxes and dummies. Flannelette, old linen, oil M.80, boiling water and funnel.

iv. The following table is a guide to the condition of the gun, mounting, sights, spare parts and tools on the occasions mentioned.

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Part of weapon (1)	Prepared for firing (2)	Immediately after firing (3)	Normal state (4)	Prepared for inspection (5)	Storage for long periods (6)
Bore	Dry cleaned.	Oiled.	Oiled.	Dry cleaned.	Coated with mixture 50 per cent. mineral jelly and 50 per cent M. 80.
Working parts of gun and mounting.	Oiled.	Oiled.	Oiled.	Dry cleaned.	Do.
Exterior of barrel	Oiled.	Oiled.	Oiled.	Dry cleaned.	Do.
Bright or browned surfaces ...	Slightly oiled.	Oiled.	Oiled.	Dry cleaned.	Do.
Muzzle covers	Off.	On.	On.	Off.	As ordered.
Telescopes	Fitted.	Fitted.	Stored in special case.	Fitted.	Stored in special case.
Spare parts	Slightly oiled.	Slightly oiled.	Oiled.	Dry cleaned.	Coated with mixture 50 per cent. mineral jelly and 50 per cent. M. 80.

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v. *Sequence of instruction.*

For instructional purposes, maintenance gunnery will be taught in stages, as set out below :—

(*a*) Special remarks—given in the form of an explanation by the instructor.
(*b*) Care and preservation of telescopes.
(*c*) To clean the barrel.
(*d*) To fit and use the double pull-through.
(*e*) Daily cleaning.
(*f*) Preparation for weekly inspection.
(*g*) Cleaning after firing.
(*h*) Care of ammunition, belts and boxes.

Demonstration and explanation are best combined in teaching these stages, each stage being thoroughly mastered before the next is begun.

NOTE.—The following sequence will be adhered to :—

(1) Gun.
(2) Mounting.
(3) Sights.
(4) Spare parts and tools.
(5) Belts, belt boxes and ammunition.

All lessons will be of a practical nature, and will be carried out in conjunction with " Points before, during and after firing ", " Repairs and adjustments " and " Examination of machine guns, mountings, etc.,"—*see* " Method of instruction ", Secs. **8**, **9** and **10**.

8. POINTS TO BE ATTENDED TO BEFORE, DURING AND AFTER FIRING

1. Object.

As for 3-pr. Pamphlet No. 1.

2. Points before firing.

i. *Gun.*

(*a*) Remove the gun from the mounting.
(*b*) Strip, thoroughly clean and attend to the points laid down in " Examination of machine guns and mountings, etc.".
(*c*) Renew the packings if necessary.
(*d*) Lubricate all bearing and frictional surfaces with oil M.80, paying special attention to the following parts :—

Barrel—whole of exterior surface, with exception of front end, which is a gas affected part. Front and rear packings.

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Recoiling portions, lock guides on side-plates, working parts of lock, especially levers, face of lock and extractor. Face of feed block, crank bearings, extractor stop on front cover, curved ramps, lock guides, firing mechanism and check lever.

(*e*) The bore, front and rear cup of the muzzle attachment and outer casing, and front end of the barrel, are gas-affected parts and will therefore be thoroughly dry cleaned.

(*f*) Assemble the gun; owing to the inaccessibility of parts once the gun is in the mounting, special care must be taken to ensure that all parts are assembled in accordance with the procedure laid down in stripping lessons.

Before assembling the lock, ensure that the adjusting nut on the connecting rod is tight. Cock the lock and test the firing mechanism.

Test the free working of the recoiling portions—with the gun horizontal, cock the lock, remove the fuzee spring and box, turn the crank handle to the vertical position, hold the crank handle with the right hand and the fuzee witn the left hand and move the recoiling portions backwards and forwards. Examine the barrel to see if it goes right home when in the forward position. Replace the fuzee spring and box.

Ensure that the rubber joint ring is correctly fitted.

(*g*) Fill the barrel casing with water.—Remove the screwed plug from the top of the barrel casing at the rear end. With the gun horizontal, pour in water until correctly filled and replace the screwed plug. Ensure that the drain plug is secure.

The filling plug hole will not be screwed up tight; otherwise, when the gun becomes hot, difficulty may be experienced in removing the plug.

Correct filling and maintenance of water in Vickers machine guns, particularly those in armoured fighting vehicles, during firing is of vital importance. Serious damage to the gun will result if these points are not observed.

(*h*) Weigh the recoiling portions, fuzee spring and lock spring. For full information *see* Secs. **9** and **10**.

(*i*) Replace the gun in the mounting. Care should be taken to keep the steam tube clear of the feed and retaining pawls of the left-hand feed blocks.

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ii. *Mounting and turret.*

(*a*) Clean and lubricate all bearings and frictional surfaces of the mounting.

(*b*) Clean and lubricate the elevating and traversing mechanism.

(*c*) Ensure that all nuts, bolts and split pins are secure.

(*d*) Ensure that the cartridge case deflector is adjusted; the clamping band of the deflector fitted over the red band painted round the protecting jacket.

(*e*) Ensure that the cartridge case tray is correctly fitted.

(*f*) Ensure that the ammunition box carriers are secure and not damaged.

(*g*) Ensure that the steam escape extension tube is correctly fitted, and not damaged and that the tube is clear for the escape of steam.

(*h*) Test :—

(1) Elevating gear to fullest extent.

(2) Traversing mechanism, complete rotation of turret.

(3) Sights.

(4) Firing mechanism.

iii. *Spare parts and tools.*

(*a*) Ensure that the supply is correct, cleaned, examined and correctly stowed in their respective containers.

(*b*) Ensure that the spare lock is examined, the lock spring weighed, and prepared for firing.

(*c*) Ensure that the oil cans are filled.

(*d*) Ensure that the spare lock, oil can and clearing plug are in their respective cases near the mounting.

(*e*) Ensure that the reserve water supply containers are filled.

(*f*) Examine and test the spare telescope.

iv. *Ammunition.*

(*a*) Ensure that the belts are correctly filled in accordance with the instructions laid down in Sec. **6**.

(*b*) Ensure that the long brass strips are not bent, and the belt not torn. Any belt with loose pockets will be exchanged. Ensure that belts are placed in the belt box according to whether the feed is left or right hand.

(*c*) Ensure that the boxes are free from damage.

NOTE.—1. It is important that special attention be given at all times to the condition of belts and boxes for use in armoured fighting vehicles; neglect will cause serious delays during firing.

2. The above examination is best carried out outside the vehicle.

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v. *Inspection of armament.*

Remarks.—As for 3-pr. Pamphlet No. 1.

(*a*) *Gun.*

(i) Outside :—

1. Muzzle cover removed.
2. Outer casing muzzle attachment secure.
3. Examine for leakage of water.
4. Rain shade secure.
5. Cartridge case deflector and tray correctly fitted.

NOTE.—Muzzle covers will not be replaced if action is imminent.

(ii) Inside :—

1. Gun secure in mounting.
2. Condenser tube correctly fitted.
3. Cheek pad, rear pad or shoulder-piece correctly fitted.
4. Examine and test firing gear.
5. Test level of water ; if necessary, replenish.

(*b*) *Turret.*

(i) Seat adjusted correctly.
(ii) Inspect turret lamp.
(iii) Unlock turret and lower on to roller.
(iv) Test free working of :—

1. Turret, by traversing completely round. Relock in travelling position—*i.e.* 12 o'clock.
2. Observation ports.
3. Shutter in turret roof and locking catch.

(*c*) *Mounting.*

(i) Test mounting lock, leaving in " unlocked " position.
(ii) Test for full elevation and depression.
(iii) Adjust mounting brake.
(iv) Spanner secured by its chain and housed in spring clips provided.
(v) Brow pad correctly adjusted and secure.
(vi) Telescope shutter working correctly.
(vii) Telescope correctly fitted, lenses clean and focussed. Sights tested and range set at 600 yards. Close shutter.
(viii) Gun secured in travelling position by mounting lock.

(*d*) *Spare parts, tools and ammunition.*

(i) Spare parts examined and correctly stowed.
(ii) Spare lock, clearing plug and oil can in special cases.
(iii) Container for reserve water supply filled.

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(iv) Examine ammunition, belts and boxes, and place a box in the carrier ready for loading.

NOTE.—The examination of ammunition, belts and boxes should, if possible, be dealt with outside the tank.

3. Points during firing.

i. *During actual firing.*

A careful check must be kept on the number of rounds fired. After each 500 rounds the water in the barrel casing will be replenished and the cartridge case tray emptied.

ii. *During a temporary cessation of fire.*

(*a*) Replenish the water supply.
(*b*) Empty cartridge tray as required.
(*c*) Oil the lock and all frictional surfaces.
(*d*) Remove a partly used belt and replace it with a full one.
(*e*) Replenish the immediate ammunition supply.
(*f*) Ensure that the gun is secure in the mounting.
(*g*) Carry out any necessary repairs or adjustments.

4. Points after firing.

i. *Immediately.*

(*a*) Ensure that the gun is unloaded.
(*b*) Clear the ejection tube.

(i) See that the gun is pointing in the direction of the target and the usual safety precautions are observed.

(ii) Lower the trigger guard, but do not remove.

(iii) Place an empty case on the end of a prepared flexible rod of wood or metal, approximately 15-in. long.

(iv) Place the base of the empty cartridge against the base of the cartridge in the ejection tube and *press* the rod through the ejection tube.

NOTE.—It must be emphasised that no undue force must be used in clearing the tube. In the event of a jam in the ejection tube the following procedure will be adopted :—

Remove the trigger guard from the gun. Label " Dangerous ; Explosive " and lock in a safe place. Circumstances permitting, report at once, by telegram to :—

C.I.S.A.,
Enfield Lock,
Middlesex.

(*c*) Oil the gas-affected parts, including the face of the extractor and the point of the firing pin.
(*d*) Ease the lock spring.

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(*e*) Gun clamped in travelling position.

(*f*) Spare parts, tools and ammunition. The spare lock, if it has been used, will be oiled up. Empty the cartridge case tray, separate live rounds from empty cases, collect used belts in readiness for removal from the vehicle.

ii. *To be carried out later.*

(*a*) *Gun.*

Remove from the mounting. Empty the barrel casing of water, strip and thoroughly clean. Ensure that no water remains in the barrel casing. (For method of cleaning barrel *see* Sec. 7, 6.) Special attention must be given to the gas-affected parts, the face of the extractor and the point of the firing pin.

To clean the ejection tube—place in the cleaning rod or split stick a piece of flannelette approximately 4-in. by 6-in. and dry clean the tube; repeat, using well-oiled flannelette. Dry clean and lightly oil. A careful examination of the gun will be carried out during cleaning. All parts will be returned to their normal state as set out in the Table, *see* Sec. 7, 12, iv.

(*b*) *Mounting and turret.*

Clean, examine and lubricate. Return the mounting to its normal condition as set out in the Table, *see* Sec. 7, 12, iv.

(*c*) *Sights.*

See Sec. 7, 5, " Care and preservation of telescopes ". Return to its original condition as set out in the Table, *See* Sec. 7, 12, iv.

(*d*) *Spares and tools.*

Clean, examine and slightly oil, replacing any broken or damaged part. Report deficiencies.

(*e*) *Ammunition.*

Remove empties. Refill partly used belts and replenish supply.

5. Method of instruction.

i. *Object.*

As for 3-pr. Pamphlet No. 1.

ii. *Sequence of instruction.*

For instructional purposes, points before, during and after firing will be taught in the stages set out below :—

(*a*) Points before firing.
(*b*) Points during firing.
(*c*) Points after firing.

Method of instruction.

A full knowledge of the details of " Points before, during and after firing ", " Maintenance—gunnery " and " Examination of machine guns, mountings, etc.", as set out in this

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chapter, is necessary in order to obtain maximum efficiency and to prolong the life of the gun, mounting and accessories.

In teaching the lesson "Points before, during and after firing", each stage will be thoroughly mastered before the next is begun. It is essential that this lesson be carried out practically, all the points laid down in Secs. **7, 9** and **10** being incorporated as may be necessary.

NOTE.—The following sequence will be adhered to :—

(1) Gun.
(2) Mounting.
(3) Sights.
(4) Spare parts.
(5) Belts, belt boxes and ammunition.

9. REPAIRS AND ADJUSTMENTS

1. General remarks.

It is essential that gunners should be able to carry out any of the repairs and adjustments set out below. The maintenance of a gun when in action depends on the gunner's ability to carry out minor repairs and so to ensure maximum efficiency.

2. Testing and adjusting sights.

i. For the ·303-in. M.Gs., Marks IVA, Mark IVB or VI, co-axially mounted with the 3-pr. gun, *see* Pamphlet No. 1.

ii. For the ·303-in. M.Gs., Marks IVA, IVB or VI, and ·5-in. M.Gs. mounted in the turret of the Lanchester armoured car. Telescope, sighting, No. 24, Mark I.

(*a*) *General preparation.*

(1) The gun should be fitted with its own telescope. Clean the lenses. Secure the telescope in the holder, ensuring that the key on the telescope fits correctly in the key way of the telescope bracket. Adjust the brow pad, focus the telescope and set the range at zero.

(2) Ensure that the guns are correctly fitted to the mounting.

(3) Remove the lock of the ·5-in. M.G. and working parts of the gun, until the bore can be looked through clearly.

(4) To assist in focussing the bore of the M.G., an empty case with a small hole drilled accurately through the centre of the base may be used in the chamber.

(*b*) *The distant point method.*

(1) Select a well defined aiming mark, preferably not less than 500 yds. from the gun. Align the axis of the

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bore of the ·5-in. M.G. on the distant aiming mark and secure the mounting so that the gun will not move.

(2) If the adjustments are correct, the axis of the telescope and bore will appear to be directed on to the same aiming mark. The sight is then correct.

(3) There may, however, be vertical or lateral error, or a combination of both (*i.e.* the axis of the telescope is not directed on to the distant aiming mark). Errors will be corrected as follows :—

The telescope holder is secured to the mounting by two fixing bolts, situated at the front and rear of the holder on the under side. Two adjusting screws are provided at each end for adjustment purposes. By loosening the front fixing bolt and the lock nut on the front adjusting screw, the holder may be moved vertically. A lateral adjustment of the holder is obtained by slackening the rear fixing bolt and the lock nut on the rear adjusting screw.

Vertical adjustment.

Loosen the lock nut on the front adjusting screw and the nut of the front fixing bolt. Screw up, or unscrew the adjusting screw until the horizontal wire is directed on to the aiming mark. Tighten the fixing bolt and lock nut of the adjusting screw, when the adjustment has been completed.

Lateral adjustment.

Loosen the lock nut on the rear adjusting screw and the nut of the rear fixing bolt. Screw up or unscrew the adjusting screw until the vertical wire is directed on to the aiming mark. Tighten the fixing bolt and lock nut of the adjusting screw, when the adjustment has been completed.

N.B.—During these operations repeated checking of the axis of the bore and telescope must be carried out to ensure that they have not been disturbed.

iii. For armoured fighting vehicles equipped with telescope, sighting, No. 24 with adjustable crosswires.

(*a*) *General preparation.*

(1) Secure the telescope in the holder, ensuring that the key on the telescope fits correctly in the key way of the telescope bracket. Adjust the brow pad and focus the telescope.

(2) Ensure that the gun or guns are correctly fitted to the mounting.

(3) If there are two turret guns mounted co-axially, and one is a ·5-in. M.G., this will be used in the testing

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and adjusting of sights. Remove the lock of the ·5-in. M.G. and working parts of the gun, until the bore can be looked through clearly.

(4) For ·303-in. M.G. in mountings, machine gun No. 7, 8 and 9. Remove the lock. Place an empty case or suitable object between the crank handle and check lever, thus bringing the hole in the crank into alignment with the hole in the rear cross-piece and the barrel. The connecting rod should be to the rear.

(5) To assist in focussing the bore of the M.G., an empty case with a small hole drilled accurately through the centre of the base may be used in the chamber.

(*b*) *The distant point method.*

(1) Select a well defined object approximately 500 yards from the gun. Align the axis of the bore on the distant aiming mark and secure the mounting so that the gun will not move.

(2) If the adjustments are correct, the axis of the telescope and bore will appear to be directed on to the same aiming mark. The sight is then correct.

(3) There may, however, be vertical or lateral error, or a combination of both (*i.e.* the axis of the telescope is not directed on the distant aiming mark). Errors will be corrected by moving the crosswires of the telescope until the intersection appears on the same object as the M.G. bore.

3. Instructions for weighing and adjusting the fuzee spring.

Take out the lock, place the loop of the spring balance over the knob of the crank handle, and, standing on the left of the gun, rest the left wrist on the breech casing and pull the spring balance vertically. The reading indicated, when the crank handle begins to move, will be the weight of the fuzee spring. This weight should be between 7 and 9 lb. Three readings will be taken. The average of the three readings will be the weight of the fuzee spring.

If the fuzee spring is not the correct weight, adjust by means of the vice pin ; six clicks (three revolutions) makes a difference of approximately 1 lb. Turning the vice pin clockwise decreases the weight, and anti-clockwise increases the weight. The tension of the fuzee spring should always be kept as high as possible consistent with maintaining the normal rate of fire of 500 rounds a minute.

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4. Instructions for the renewal of packings.

i. *The cannelure.*

Select a piece of asbestos string, ensure that it is free from dirt, grit, lumps, etc.; draw the string through the fingers to smooth down the frayed edges; make the end of the string into a point.

Hold the barrel so that the bullet lead is at the bottom, wind a strand of asbestos in the cannelure of the barrel, in a clockwise direction, beginning on the left side, carefully pressing each strand together with a piece of shaped wood, or screwdriver, until the cannelure is full, finishing on the right side; break the string and make the end into a point and force it into the cannelure. Smooth down the asbestos packing with a piece of smooth wood, then oil it. Continue by forcing the asbestos packing down into the cannelure until nearly flush with the barrel, clean and re-oil. Fit the side plates to the barrel and replace in the gun, carefully working the barrel into the sleeve until the packing is free to enter, work the barrel to and fro, to ease the packing, lubricate and clean when necessary. Withdraw the barrel from the gun, clean round the packing and the barrel sleeve, re-oil, assemble the recoiling portions to the gun. Weigh the recoiling portions.

The desired weight is 4 lb.; if slightly over, but not exceeding 5 lb., the weight will be considered as correct.

NOTE.—The object of starting the packing on the left underside and finishing at the right underside of the barrel is to reinforce the packing on the underside where the bulk of the wear takes place.

ii. *The front packing.*

Remove the muzzle attachment and gland. Select a piece of asbestos and thoroughly soak in oil. Stand the gun on the rear cross-piece. Wind the asbestos loosely round the barrel sleeve, and at the same time press into position with a No. 3 punch a piece of wood or any blunt ended tool; when the hole is full, screw on the gland as tightly as possible. If the gland will not screw home, return the gun to the horizontal position, hang the lock and work the recoiling portions backwards and forwards to ease the packing. If the packing is found to press too hard on the barrel, remove the gland and a portion of the asbestos packing. Finally, ensure that the gland is screwed right home and weigh the recoiling portions.

Should there be water leaking past the gland, remove the gland and insert more packing until correct. If the leakage of water is very bad, it may be necessary to put in a complete new packing.

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5. Instructions for weighing the recoiling portions.

i. Remove the fuzee spring.

ii. Place the crank handle nearly vertical, and work the recoiling portions backwards and forwards to ease the packing.

iii. Place the loop of the spring balance over the right end of the crank shaft and pull slowly to the rear.

iv. The weight should not exceed 5 lb.

6. Instructions for use of the belt repairing tool.

Remove the damaged strips and eyelets, taking care not to damage the webbing. If a long brass strip is being fitted, the outer end will be joined together before fitting to the belt. One end of the eyelet is flanged; this will be placed in the dished portion of the belt repairing tool, leaving the other end of the eyelet free for engagement of the small punch on the tool.

Place the two long brass strips together, put in an eyelet and engage the belt repairing tool. Press the handles together, keeping the strip horizontal, move the belt repairing tool to and fro in a circular motion, with the punch of the tool as the centre. This action shapes the head of the eyelet. Put the strips in position on the belt, insert the eyelets and repeat the above operation with the tool.

Short strips are fitted in a similar manner, except that they are not joined at one end before being placed on the belt. Care must be taken to press the eyelets as far through the strips as possible before the tool is used.

7. To repair a torn belt.

Cut out the torn portion and sew or rivet together the good ends and place on the brass strips. The cutting of the belt should be done in such a manner as to ensure that the repair to the top portion of the webbing does not coincide with the repair to the bottom portion.

8. Method of instruction.

i. *General remarks.*

ii. *Equipment required.*

(*a*) Gun correctly mounted in the vehicle, or on special mounting.

(*b*) Spare parts and tools.

(*c*) Telescope.

iii. *Method and sequence of instruction.*

For instructional purposes, repairs and adjustments will be taught in stages as set out below :—

(*a*) Testing and adjusting sights.

(*b*) Weighing and adjusting the fuzee spring.

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(*c*) Renewal of packings :—
(1) The cannelure.
(2) The front packing.
(*d*) Weighing the recoiling portions.
(*e*) Repair of the belt and use of the belt repairing tool.

Demonstration and explanation are best combined in teaching these stages, each stage being thoroughly mastered before the next is begun.

All lessons will be of a practical nature, and will be carried out in conjunction with " Points before firing ", " Maintenance —gunnery " and " Examination of machine guns, mountings, etc.", Secs. **7**, **8** and **10**.

10. EXAMINATION OF MACHINE GUNS, MOUNTINGS, ETC.

1. General remarks.

It is important that not only should machine guns, mountings and accessories be examined when taken over, but that guns and mountings, etc., be examined frequently.

2. Points for examination.

i. *Gun.*

(*a*) Muzzle attachment (outer casing). Free from fouling; threads not damaged.

(*b*) Front and rear cups. Clean and free from fouling; no sign of flaws ; correct assembly.

(*c*) Gland. Clean ; threads not damaged ; vent holes clear and free from rust.

(*d*) Foresight. Not damaged ; will remain locked in the open or closed position.

(*e*) Rubber joint ring. In good condition ; note, when assembling the gun into the mounting, that the joint ring is a correct fit.

(*f*) Barrel casing. In good condition.

(*g*) Screwed plugs. In good condition ; threads of plugs and screwed holes in barrel casing not damaged.

(*h*) Condenser tube boss. Bracket securely fastened to casing, free from rust and not damaged. Hole for escape of steam clear.

(*i*) Steam tube. Head of tube correctly positioned and retained by its keeper screw ; examine for free movement of the slide valve. This can be ascertained by giving the gun a rocking motion, when the movement of the valve will be distinctly heard.

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(*j*) Front cover :—

(1) Catch engaging correctly and hinge pin and check nut secure.

(2) Tangent sight slide in good condition and working freely. Top and bottom screws secure ; must remain locked in open or closed position.

(*k*) Rear cover :—

(1) Trigger lever secure and not damaged ; spring working correctly.

(2) Catch engaging correctly, automatic fastening when cover is lowered.

(3) Hinge axis pins and split keeper pins correct.

(4) Stud retaining cheek pad correct.

(*l*) Rear cross-piece. Axis pin, check nut and split keeper pin secure ; rear cross-piece engaging correctly with side plates of breech casing, " T " fixing pin fitting correctly.

(*m*) Bottom plate. Elevating bracket securely fastened to bottom plate ; step for engagement of the trigger guard catch not damaged.

(*n*) Mounting base. Free from burrs ; hole for recoil pin clear and not damaged.

(*o*) Ejection tube sleeve. Clean and free from rust.

(*p*) Trigger guard :—

(1) Ejection tube. Clean and free from rust, bush axis and keeper pin correct ; cartridge check and axis pin correct.

(2) Drip plate not damaged.

(3) Safety catch working correctly ; thumb-piece assembled on correct side.

(4) Trigger mechanism working freely, clean and free from damage ; layshaft lever assembled correctly and free from burrs.

(5) Trigger guard catch working correctly, clean and free from rust.

(6) Examine the loading catch, for free working, note the action of the spring when pressure on the chain is released. Spring tension is adjusted by re-positioning the sleeve.

(*q*) Right outside plate :—

(1) Layshaft bracket securely fastened.

(2) Layshaft correctly assembled to bracket, recess in head of layshaft free from burrs, correct engagement of trigger lever.

(3) Check lever bracket securely fastened ; check lever held securely.

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(4) Crank handle secure.
(5) Slide free from burrs; roller, collar and keep pin correctly assembled and secure.

(*r*) Left outside plate :—

(1) Bracket and stud for retaining fuzee box secure.
(2) Fuzee box in good condition, free from flaws; stud for assembly of cheek pad correct; adjusting screw and sleeve free from damage, adjusting screw held securely by nut with keep pin.
(3) Fuzee spring fittings not damaged.
(4) Fuzee and chain in good condition, fuzee assembled correctly to crank.
(5) Fuzee spring correct weight.
(6) Extractor safety stop free from burrs and working correctly.
(7) Slide free from burrs; stud for holding fuzee box correct.

(*s*) Barrel. Outside of barrel free from rust and not damaged, no rust in cannelure, barrel trunnions free from burrs. Extractor grooves on face of barrel free from burrs. Barrel sleeve secure. Examine the interior of the barrel carefully for rust, cuts, erosion, nickelling, cord wear and bulges, as follows :—

(1) First with the eye close to the breech, then with the eye some inches from the breech, examine the bore, rotating the barrel very slowly. Erosion may be found in the lead.
(2) The barrel should now be reversed and examined from the muzzle in a similar manner.

(*t*) Feed block :—

Examine the stud for burrs, examine for flaws in top and bottom levers, correct assembly of levers, split keeper pin in position. Feed and retaining pawls not damaged and working correctly; cartridge guide not damaged.

(*u*) Lock. Strip and examine, free from rust and damage; ensure that the face of the extractor is free from fouling, gib and spring removed; examine housing for rust, extractor grooves not damaged. Extractor detent working correctly.

(*v*) Side plates :—

(1) Left side plate clean and free from rust, side plate spring correct, flanges free from burrs.
(2) Right side plate clean and free from rust, side plate spring correct, flanges not burred, connecting rod not damaged.

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(*w*) Assemble the recoiling portions, first ensuring that the packings are correct, test the weight of the recoiling portions. If they are too heavy, examine for :—

(1) Tight packings.
(2) Damaged side plates of the breech casing.
(3) Slightly bent or damaged side plates.

(*x*) Fill the barrel casing with water and work the recoiling portions; there should be no leakage.

(*y*) The lock will be tested as follows :—

(1) Side levers and extractor levers. Remove the feed block and keep the front cover raised. Draw back the crank handle and let it go slowly forward on to the check lever; if correct, the extractor should now be in its highest position.
(2) Bents of sear and firing pin. Pull the crank handle on to the roller, press the trigger and, while maintaining pressure, let the crank handle go slowly forward on to the check lever. The extractor should be in its highest position before the sear releases the firing pin.
(3) Extractor. Remove the lock, examine for burrs and flaws, extractor detent working correctly.
(4) Nose of trigger and bent of tumbler. Cock the lock, release the sear; the firing pin should be held back.
(5) Firing pin. No part broken; examine for flaws.
(6) Lock spring. Test weight as follows :—Fully cock the lock, place the bottom of the lock casing on a flat surface, place the loop of the spring balance over the side lever head and, with the left hand on top of the lock, draw the side lever head upwards with the spring balance. The weight recorded should be from 12 to 14 lb.

ii. *Mounting.*

(*a*) Clean and examine for rust, flaws and breakages.
(*b*) Lubricate all bearing and frictional surfaces.
(*c*) Ensure that all parts are secure.
(*d*) Test for elevation and traverse.
(*e*) Accessories of mounting examined and correctly fitted.
(*f*) Correct fitting of gun in mounting.

iii. *Spare parts.*

(*a*) Check for correct numbers and examine.
(*b*) Correctly stowed.

iv. *Belts and boxes.*

(*a*) Examine belts for loose or torn pockets, bent and broken strips, clean, free from grit, dirt, etc.
(*b*) Boxes clean and not damaged.

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3. Method of instruction.

i. *General remarks.*

ii. *Equipment required.*

(*a*) Gun and mounting.
(*b*) Spare barrel.
(*c*) Spare parts complete.
(*d*) Belt and belt boxes.

iii. *Method and sequence of instruction.*

A gun will be carefully prepared beforehand so that the points relating to examination of machine guns, mountings, etc., can be brought out. Care must be taken not to cause any permanent damage to the weapon.

The instructor will detail the crew under instruction to examine the gun and take notes of any defects, etc., no explanation having been given as to the method of carrying out the lesson. At the conclusion of the examination by the crew the instructor will question them on the result of their examination.

The lesson will now be carried out in the sequence set out for examination of machine guns. All faults which were prepared will now be rectified as instruction progresses.

Demonstration and explanation will be combined for the purpose of this lesson. This lesson will be carried out practically by each member of the crew, and will be carried out in conjunction with "Maintenance—gunnery", "Points before, during and after firing" and "Repairs and adjustments", Secs. **7**, **8** and **9**.

11. GENERAL HANDLING BY THE GUNNER

1. To load.—(For guns fitted with left-hand feed block).

i. Before placing the belt box in the carrier, the gunner will ensure that the small cover of the belt box is open, and that the tag of the belt is ready for insertion in the feed block.

(*a*) Elevate the gun.
(*b*) Pass the tag of the belt through the feed block, gripping it with the right hand and pulling the belt through until the first cartridge is held by the retaining pawls.
(*c*) Pull down on the loading catch chain.
(*d*) Pull the crank handle to the rear until the tail of the crank handle is clear of the loading catch. Release the crank handle.
(*e*) Maintain pressure on the loading catch chain.
(*f*) Repeat (*d*).
(*g*) Release the loading catch chain.

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ii. The method of loading without the loading catch is similar to that described above, with the following differences :—

(*a*) Repeat as for i, (*a*) and (*b*) above.

(*b*) With the right hand, pull the crank handle back on to the roller.

(*c*) With the left hand under the breech casing, pull the belt to the right, and slightly to the front. Release the crank handle.

(*d*) Repeat (*b*) and (*c*).

2. To load.—(For guns fitted with right-hand feed block).

i. Ensure that the small cover of the belt box is open, and that the tag of the belt is ready for insertion in the feed block.

(*a*) Pass the tag of the belt through the feed block, gripping it with the left hand and pulling the belt through until the first cartridge is held by the retaining pawls.

(*b*) Repeat as for 1, i. (*c*), (*d*), (*e*), (*f*) and (*g*) above.

ii. The method of loading without the loading catch is similar to that described above with the following differences :—

(*a*) Repeat as for 2, (*a*).

(*b*) With the right hand, pull the crank handle back on to the roller.

(*c*) With the left hand, pull the belt to the left and slightly to the front. Release the crank handle.

(*d*) Repeat (*b*) and (*c*).

3. Firing position of gunner.

i. *Light tanks.*

(*a*) Grip the handle of the traversing wheel with the left hand.

(*b*) Hold the trigger guard with the right hand, first and second fingers on the finger trigger, thumb round the pistol grip and resting on the safety catch.

(*c*) Right shoulder firmly pressed into the shoulder piece.

(*d*) Forehead pressed firmly against the head-rest and eye looking through the telescope.

NOTE.—The gun is fired by depressing the safety catch with the thumb and pulling back the finger trigger.

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ii. *Medium tanks—co-axially mounted M.G.*

Gunner.—As for 3-pr. Pamphlet No. 1.

Loader.—As for 3-pr. loader, except that he will be facing the co-ax. gun and will not be holding a 3-pr. round.

NOTE.—The gun is fired in a similar manner to the 3-pr. gun, except that pressure will not be released from the firing trigger until the gunner wishes to stop firing or a stoppage occurs. When a stoppage does occur, the trigger must be released until the loader has rectified the stoppage.

4. To unload.

i. Pull the crank handle on to the roller twice.

ii. Release the lock spring.

iii. For left-hand feed blocks: Press down the retaining and feed pawls with the fingers of the right hand and withdraw the belt with the left hand until the first cartridge is clear of the feed block.

For right-hand feed blocks: Press the feed and retaining pawls of the feed block with the right hand, the feed pawls being pressed with the fingers and the retaining pawls with the thumb, taking care to keep the hand clear of the feed block. Withdraw the belt with the left hand until the first cartridge is clear of the feed block.

NOTE.—When the command "Cease firing" is given, the belt will be removed from the feed block and repacked in the belt box.

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APPENDIX 1

NOTES FOR INSTRUCTORS ON THE ·303-IN. M.Gs. MARKS IVA AND IVB

1. The ·303in. M.Gs. Marks IVA and IVB are similar to the ·303-in. M.G. Mark VI in detail and method of instruction. with the following exceptions :—

2. General description.

i. *Description of non-recoiling portions.*

(*a*) *Barrel casing—Exterior.*

The outer casing of the muzzle attachment is a hollow cylinder screwed internally at the front end to receive the front cone. It is bored and grooved at the rear end to form an inner flange, interrupted for connection with the gland, which has an outer flange correspondingly interrupted to engage with it.

Four radial grooves are cut in the outer surface, at the rear end, to receive the muzzle attachment lock, which will engage in any one of the grooves.

Vent openings for the escape of gases are cut near the front end of the outer casing. The disc is pressed home on the front cone before the latter is screwed into the outer casing. The Mark II front cone is conical in shape, so that, if it is struck by bullets, they may glance off. The front cone is bullet proof.

The front cone and gland have flanges which are grooved to receive the combination tool provided for assembling and stripping purposes. The gland is locked in position by the gland keeper screw, the end of which engages in one of the grooves in the flanges.

The front of the end cap is tapped for assembly of the gland keeper screw.

The steam tube of the Mark IVA gun is positioned by the chisel mark on the head of the tube coinciding with a similar cut on the trunnion block and is not interchangeable.

The ejection tube cartridge check consists of a small lever operated by a ribbon spring, acting in a lateral direction.

The mounting plate is slotted on its underside to give access to the cartridge check and spring.

(*b*) *Breech casing—Exterior.*

On the outside of the left outside plate are two studs for holding the front end of the fuzee spring box. The front end of the fuzee spring is attached to the breech casing by means

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of the fuzee spring box and adjusting screw, which passes through the front end of the fuzee spring box and through the nut at the front end of the spring.

Interruptions are formed in the grooves of the bottom plate for the assembly of the pistol grip, trigger guard and firing mechanism. A loop for attaching the cheek pad is formed on the left side of the bottom plate.

The rear cover catch is of the vertical slam type, consisting of a catch which engages in the slot in the right outside plate and an actuating lever with a curled thumb-piece formed at its outer end. The catch is pivoted in the bracket attached to the right side of the rear cover.

Two loops are formed on the rear cover to attach the cheek pad.

(*c*) *Breech casing—Interior.*

A flat spring, which is housed in the right ramp, is provided to retain the rear cover catch in the closed position.

(*d*) *Pistol grip, trigger guard and firing mechanism.*

Interrupted flanges are formed at the top of the guard to engage in the grooves in the bottom plate. The guard is retained in position by means of a spring catch.

ii. *Description of recoiling portions.*

(*a*) *Muzzle cup.*

Is bored and threaded at the rear end to screw on to the front end of the barrel.

(*b*) *Barrel.*

Is threaded at the front end to receive the muzzle cup.

iii. *General particulars.*

Weight of:—

Gun—without water and shoulder-piece ...	38 lb. (approx.).
Shoulder-piece (includes upper weight, 2 lb. 7½ oz.)	15 lb.
Rear pad	1¼ lb.
Barrel.	
Weight	4⅛ lb.
Length	28·4 in.
Rifling	Enfield system.

iv. *General introduction.*

Name: ·303-in. Vickers machine gun, Mark IVA or Mark IVB.

Weight—Without water	38 lb.
With water	46¾ lb.
With shoulder-piece, No. 3 ...	61¾ lb.

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3. Stripping.

i. *General remarks.*—As for the ·303-in. M.G. Mark VI.

ii. *Normal stripping.*

(*a*) *Pistol grip, trigger guard and firing mechanism.*

Disengage the spring catch from its recess in the bottom plate and ease the assembly to the rear until the flanges are clear of the interrupted flanges on the bottom plate, and lift out.

N.B.—In removing or replacing the assembly, the finger must be clear of the trigger.

(*b*) *Outer casing muzzle attachment and muzzle cup.*

Raise the foresight to an angle of approximately 45 degrees, rotate the outer casing muzzle attachment one-sixth turn and withdraw. Lower the foresight, unscrew and remove the muzzle cup.

(*c*) *Fuzee spring box.*

With the right hand at the rear of box and left hand at the front, press the box forward until clear of the studs.

iii. *Stripping other parts*—(*a*) *By the gunner :*—

(1) *Front cone.*

Unscrew. Special care must be taken before removing or replacing the front cone to ensure that the gland is held correctly by the gland keeper screw and the outer casing of the muzzle attachment by the foresight.

(2) *Gland.*

Disengage the gland keeper screw from the recess in the gland, raise the foresight to an angle of approximately 45 degrees and unscrew the gland.

(*d*) *By qualified armourer only :*—

(1) *Rear cover catch spring.**

Remove the split pin and axis of the catch and catch lever, lift out the catch and lever. To remove the spring, insert a No. 3 punch into the small hole on the right ramp and disengage the locking stud of the spring ; when the stud is clear of the hole, pull the spring to the rear. To assemble the spring, positioned near the centre of the spring are two guides ; these engage in recesses cut away on the inner side of the right ramp. When replacing the spring, insert the guides into the recesses and push forward. Ensure that the locking stud of the spring is correctly engaged.

(2) *Layshaft.**

Drive out the keeper pin securing the layshaft lever to the shaft, from the inner side ; remove the layshaft lever. The keeper pin is assembled through the hole drilled in the layshaft housing.

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3. *Pistol grip, trigger guard and firing mechanism.**

i. Trigger guard catch and spring. Push in the catch and remove the split pin from the catch ; remove the catch and spring.

ii. Firing mechanism. Remove the keeper pin from the trigger catch guide pin ; remove the pin, lift out the trigger mechanism.

Trigger catch and spring. Remove the axis pin, catch and spring.

(4) *Ejection tube and cartridge check and spring.**

Force in the cartridge check spring, so disengaging the lug on the rounded surface of the spring, from its seating, and remove. Insert a forked shape piece of wire into the two holes in the body of cartridge check, and lift out.

Care must be taken in assembling to ensure that the spring, the ends of which are shaped to engage with the catch, and the lug on the rounded surface of the spring are correctly positioned.

4. To clear the ejection tube.

i. Ensure that the gun is unloaded.

ii. See that the gun is pointing in the direction of the target and the usual safety precautions are observed.

iii. Open the rear cover and, if necessary, remove the cartridge that may be on the extractor ; hang the lock.

iv. Place an empty case on top of the pistol grip, with its rim towards the front of the gun.

v. Close the rear cover.

vi. Stand clear of the rear of the gun.

vii. Insert the cleaning rod through the lower hole in the rear cross-piece into the empty case, and *press* the rod with the empty case, through the ejection tube.

NOTE.—It must be emphasized that no undue force must be used in clearing the tube. In the event of a jam in the ejection tube the following procedure will be adopted :—Remove the gun from the mounting, label "Dangerous—Explosive" and lock in a safe place. Circumstances permitting, report at once by telegram to :—

C.I.S.A.
Enfield Lock,
Middlesex.

5. Instructions for fitting spare disc for the front cone of the muzzle attachment.

Unscrew the front cone. Cut the edge of the disc, driving sufficient metal up to provide a hold for the pliers. Remove the disc and replace it with a new one. In replacing it may be necessary to tap the disc on to the front cone.

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APPENDIX 2

NOTES FOR INSTRUCTORS ON THE ·303-IN. M.G. MARK I.

1. The ·303-in. M.G. Mark I is similar to the ·303-in M.G. Mark VI in detail and method of instruction, with the following exceptions :—

2. General description.

i. *Description of non-recoiling portions.*

(*a*) *Barrel casing—Exterior.*

The outer casing of the muzzle attachment is a hollow cylinder screwed internally at the front end to receive the front cone. It is bored and grooved at the front end to form an inner flange, interrupted for connection with the gland, which has an outer flange correspondingly interrupted to engage with it.

Three holes are provided in the outer casing at the rear end, so that the stud on the locking clip can be engaged.

Vent openings for the escape of gases are cut near the front end of the outer casing. The disc is pressed home on the front cone before the latter is screwed into the outer casing. The Mark II front cone is conical in shape, so that, if it is struck by bullets, they may glance off. The front cone is bullet proof.

The front cone and gland have flanges which are grooved to receive the combination tool. Three holes are provided in the gland so that, when the outer casing is assembled to the gland, the three holes in the former correspond with those in the latter. The stud on the locking clip can then be engaged in the hole on the upper surface of the gland and outer casing, thus securing the outer casing muzzle attachment to the gland.

The steam tube of the Mark I gun is assembled from the front of the end cap.

On top of the barrel casing is the foresight. It is set $\frac{5}{8}$ inch to the left of the axis of the barrel in order to make the line of sight and axis of the bore parallel. It is protected by side wings, formed on the block which is fixed to the barrel casing, and into which the foresight is dove-tailed. There is an opening in the right wing, through which the foresight is assembled, and a punch hole in the left wing for adjusting and removing the foresight.

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A cork plug is provided which is inserted in the steam escape hole when the gun is travelling to prevent waste of water.

The cork plug fits into a special fitting made to receive a condenser tube. This fitting is provided with a protector to be used when the condenser tube is not connected with the gun.*

There is a seating for ejection on the bottom of the barrel casing, which ensures the empty case being knocked off the extractor should it fail to drop off before the extractor is in a position to rise.

Under the rear end of the casing is a bracket to take the cross-head joint pin, which secures the gun to the tripod mounting or the spring clip of the ball mounting.

(*b*) *Breech casing—Exterior.*

(1) *Bottom plate.*

There is an opening in the bottom plate through which the empty case falls, either to the ground or into the deflector bag. This opening has a sliding shutter which, when closed, prevents dirt, etc. from entering the gun. The shutter must be moved to the rear before the gun can be loaded. If it is closed after loading, only one shot can be fired, but the empty case remains in the breech casing and another cartridge will be fed up; the extractor dropping on to the shutter will prevent the lock from going forward. The shutter is secured by a catch, with thumb-piece, plunger and spring.

Under the bottom plate is the elevating bracket to take the elevating joint pin which secures the gun to the elevating gear of the mounting.

An elevating stop is fitted on the bottom plate on the left side.

(2) *Rear cross-piece.*

The rear cross-piece is fitted with handles of wood, inside which are steel cylinders for carrying oil; these are closed by milled heads fitted with a brush and leather washer.

The firing mechanism consists of firing lever with pawl and thumb-piece and safety catch, safety catch piston and spring.

(3) *Front and rear covers.*

The tangent sight as fitted to the rear cover is graduated up to 2,900 yards. The tangent sight stem is provided with a fixed aperture sight, the aperture being bored in a semi-circular flange formed on the left of the stem at the rear end.

* For the latest pattern of condenser an adaptor replaces the protector, and is a permanent fixture to the gun.

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It is sighted for a range of 400 yards, and is for use when the stem is horizontal.

The rear cover lock has to be lifted to raise the rear cover.

(*c*) *Breech casing—Interior.*

(1) *Front and rear covers.*

The front cover has two claws which are engaged by the stem of the front cover catch.

On the inside of the rear cover is the cover lock spring which actuates the rear cover lock.

The trigger bar slides inside the rear cover. This has a lug on the right against which the trigger bar spring bears, and a projection on its rear end which engages the head of the trigger bar lever. The front of the trigger bar is slotted for the tail of the trigger to slide in when the lock is moving backwards or forwards.

The front end of the slot engages the tail of the trigger and draws it back when the trigger bar is drawn to the rear by pressure on the thumb-piece. The trigger bar is kept in position by means of projections on the lock guides on the rear cover.

(2) *Rear cross-piece.*

Inside the rear cross-piece is the trigger-bar lever, which, pivoting on the " T " fixing pin, draws back the trigger bar.

The trigger-bar lever is actuated by pressure on the thumb-piece and returned to its rest position by the safety catch spring when pressure is released.

iii. *General particulars.*

Weight of gun—28½ lb. (Guns of later manufacture, in which a number of refinements for the sake of lightness are omitted, are about 4 lb. heavier.)

Weight of protecting jacket—18 lb. (approx.).

iv. *General introduction.*

Name—·303-in. Vickers machine gun, Mark I.

Weight—

Without water and projecting jacket	28½–32½ lb.
With water	37¼–41¼ lb.
Protecting jacket	18 lb. (approx.).

Extreme range—2,900 yards.

3. Stripping.

i. *General remarks.*

As for the ·303-in. M.G. Mark VI.

ii. *Removing or replacing the gun in the mounting.*

(*a*) Mark I M.G. in mountings M.G. No. 2 Mark I and Mark IA of the medium tank Marks IA, II, IA*, II* and IIA :—

(1) Remove the elevating joint pin.

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(2) Remove the deflector bag.
(3) Press down the lever operating spring catch and lift the gun.
(4) Withdraw the gun slightly until clear of the catch.
(5) Rotate the gun until the clamping bolts on the protecting jacket are in line with the lower cut away portion of the body.
(6) Withdraw the gun until the bolts have passed through the cut away portion, ensuring that the foresight protectors are not damaged by striking against the mounting.
(7) Rotate the gun until the foresight is in line with the sight port.
(8) Holding the traversing handles with the right hand and taking the weight of the gun as far forward with the left hand as possible, withdraw the gun, taking care that the foresight protectors, etc., are not damaged.

Replace the gun in the mounting in the reverse order.

(*b*) Mark I M.G. in mountings, M.G. No. 4 Mark I, of the 1920 Mark IA and 1924 Mark I patterns of Rolls Royce armoured cars.

(1) Clamp the mounting with the gun in the horizontal position.
(2) Remove the cork plug from the steam escape outlet, and coil the chain and plug round the muzzle attachment, so that no damage is done to the chain and plug when the gun is withdrawn from the mounting.
(3) Remove the gun securing pin.
(4) Withdraw the gun from the mounting.

Replace the gun in the mounting in the reverse order.

iii. *Normal stripping.*

Similar to that of the ·303-in. M.G. Mark IV.

NOTE.—Before the outer casing of the muzzle attachment can be removed, it will be necessary to disengage the stud of the locking clip from the hole in the gland.

iv. *Stripping the lock.*

Similar to that of the ·303-in. M.G. Mark VI.

v. *Stripping the feed block (right hand).*

Similar to that of the ·303-in. M.G. Mark VI.

vi. *Stripping other parts.*

(*a*) *By the gunner :—*

(1) *Front cone.*—Similar to that of the ·303-in. M.G. Mark IV.

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(2) *Gland.*—Similar to that of the ·303-in. M.G. Mark IV, except that no gland keeper screw is fitted.

(3) *Protecting jacket.*—The gun having been removed from the mounting, remove the outer casing of the muzzle attachment. Remove the bolts from the securing bands; slide the bands to the rear end of the barrel casing; remove the two portions forming the protecting jacket; remove the leather packing; slide off the securing bands. When assembling, ensure that the packings and protecting jacket are correctly fitted.

(4) *Rear cover lock.*—Unscrew and remove the axis pin; remove the rear cover lock and spring.

(5) *Trigger bar.*—Remove the spring and withdraw the trigger bar.

(6) *Roller.*—Similar to that of the ·303-in. M.G. Mark VI.

(7) *Sliding shutter.*—Close the sliding shutter; press in the plunger of the catch with a No. 3 punch, and at the same time, press in the catch; move the shutter forward until it is clear of the breech casing.

(8) *Gib and spring.*—Similar to that of the ·303-in. M.G. Mark VI.

(9) *Tangent sight.*—Unscrew and remove the axis pin: remove the tangent sight, piston and spring.

(*b*) *By qualified armourer only:*—

(1) *Sear spring.*—Similar to that of the ·303-in. M.G. Mark VI.

(2) *Crank handle.*—Similar to that of the ·303-in. M.G. Mark VI.

(3) *Check lever.*—Similar to that of the ·303-in. M.G. Mark VI.

(4) *Front and rear covers.*—Similar to that of the ·303-in. M.G. Mark VI, except that the rear cover is fitted to the same axis pin as the front cover.

(5) *Front cover catch.*

To remove the plug, spring and plunger.—Force the plug inwards, rotate one quarter turn and remove the plug, spring and plunger.

To remove the front cover catch.—Remove the split pin and withdraw the catch.

(6) *Rear cross-piece.*

To strip.—Unscrew the firing lever axis pin and remove the firing lever with pawl. Unscrew the safety catch axis pin, remove the safety catch, piston and spring. Lift out the trigger bar lever.

When assembling, ensure that the pawl engages with the trigger bar lever.

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The rear cross-piece is removed in a similar manner to that of the ·303-in. M.G. Mark VI.

(7) *Foresight.*
The position of the foresight should first be carefully noted. Using the No. 3 punch, drive the foresight out of its dovetailed seating.

(8) *Steam tube.*—Similar to that of the ·5-in. M.G.

(9) *Tangent sight slide.*—Similar to that of the ·303-in. M.G. Mark VI.

4. The mechanism.

i. *General remarks.*

As for the ·303-in. M.G. Mark VI.

ii. *The mechanism.*

(*a*) To load (right-hand feed block).—Similar to that of the ·303-in. M.G. Mark VI.

(*b*) To fire.—Similar to that of the ·303-in. M.G. Mark VI, with the following exceptions:—The gun is fired in the following manner—Raise the safety catch and press the thumb-piece. (Remainder as for the ·303-in. M.G. Mark VI.)

(*c*) To unload (right-hand feed block).—Similar to that of the ·303-in. M.G. Mark VI.

(*d*) Action on recoil.—Similar to that of the ·303-in. M.G. Mark VI.

(*e*) First action in the feed block (right hand).—Similar to that of the ·303-in. M.G. Mark VI.

(*f*) Backward rotation of the crank.—Similar to that of the ·303-in. M.G. Mark VI.

(*g*) Second action in the feed block (right hand).—Similar to that of the ·303-in. M.G. Mark VI.

(*h*) Backward movement of the lock.—Similar to that of the ·303-in. M.G. Mark VI, with the following exceptions:—

(1) No spring-loaded safety stop plunger is fitted.

(2) As no projecting detent is fitted on the extractor, the empty case will probably fall off when the extractor drops, or be forced off the extractor by the seating for ejection as described in the forward movement of the lock.

(*i*) Cocking action.—Similar to that of the ·303-in. M.G. Mark VI.

(*j*) Action of the fuzee spring.—Similar to that of the ·303-in. M.G. Mark VI.

Method of instruction.—No empty case is required.

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(*k*) Forward movement of the lock.—Similar to that of the ·303-in. M.G. Mark VI, with the following exceptions :—

(1) Delete all reference to the empty case and ejection tube.

(2) After the sentence : " The firing pin hole is brought opposite the cap" *add*, " As the extractor rises, the empty case, if it has not already fallen off, will be forced off by the seating for ejection."

Method of instruction.—No empty case is required.

(*l*) *Firing action—First shot.*

Similar to that of the ·303-in. M.G. Mark VI, with the following exceptions :—

The side lever head going below the horizontal has caused the nose of the trigger and the bent of the tumbler to become engaged. The remainder of the firing action of the first shot is as follows :—If the safety catch is raised and the thumb-piece on the firing lever is pressed, the pawl near the bottom of the firing lever pushes forward the bottom of the trigger-bar lever ; this, being pivoted in the centre, causes the top portion to come to the rear, engaging a projection on the trigger bar and drawing it to the rear.

As the trigger bar is drawn backwards, the front end of the slot in the trigger bar engages and draws back with it the tail of the trigger, thereby releasing the nose of the trigger from the bent of the tumbler.

The long arm of the lock spring, being engaged behind the projection on the firing pin, carries the firing pin forward on to the cap, exploding the charge.

Method of instruction :—

To prepare the gun.—Remove the trigger bar, load the gun, place the trigger bar in connection with the tail of the trigger and trigger-bar lever.

(*m*) *Firing action—Subsequent shots.*

Similar to that of the ·303-in. M.G. Mark VI, with the following exceptions :—

For " The firer maintaining pressure on the trigger, etc." *read* " The firer, by maintaining pressure on the thumb-piece, holds back the trigger bar ; therefore, each time the lock goes forward, the front end of the slot holds back the tail of the trigger." Remainder as for the ·303-in. M.G. Mark VI.

Method of instruction.

To prepare the gun.—As for firing action, first shot, ·303-in. M.G. Mark VI.

(*n*) *Action inside the lock when pressure on the thumb-piece is released.*

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Similar to that of the ·303-in. M.G. Mark VI, with the following exceptions :—

For " On releasing pressure from the trigger, the trigger lever is allowed to resume its normal position " *read* " On releasing pressure on the thumb-piece, the trigger bar is allowed to resume its normal position."

(*o*) *Loading and firing action, single shot.*
Similar to that of the ·303-in. M.G. Mark VI.

(*p*) *Safety devices.*
Similar to that of the ·303-in. M.G. Mark VI.

5. Stoppages.

The stoppages and immediate action for the ·303-in. M.G. Mark I are similar to those of the ·303-in. M.G. Mark VI, with the following exceptions :—As no extractor detent is fitted to the extractor, all references to an empty case, or the rear portion of an empty case, will be deleted.

6. Points to be attended to before, during and after firing.

Similar to those for ·303-in. M.G. Mark VI, with the following exceptions :—

i. *Points before firing.*
(*a*) Protecting jacket and leather packing correctly assembled.
(*b*) Traversing handles filled with oil.
(*c*) Deflector bag fitted.
(*d*) Mounting.—The ball must be kept clean and coated with a thin film of oil or grease, except in dry weather, when it should be kept practically dry.
The ball should be tested over the extreme limits of its motions. If it is stiff, the bolts securing the ball socket to the wall of the tank may be slackened. Any play between the protecting jacket of the gun and the barrel casing must be taken up with the leather packing provided.

7. Repairs and adjustments.

i. General remarks.—As for the ·303-in. M.G. Mark VI.

ii. Instructions for fitting spare disc for the front cone of the muzzle attachment.—As for the ·303-in. M.G. Mark IV.

iii. Instructions for weighing and adjusting the fuzee spring.—As for the ·303-in. M.G. Mark VI.

iv. Instructions for renewal of packings.—As for the ·303-in. M.G. Mark VI.

v. Instructions for weighing the recoiling portions.—As for the ·303-in. M.G. Mark VI.

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vi. Instructions for use of the belt repairing tool.—As for the ·303-in. M.G. Mark VI.

vii. To repair a torn belt.—As for the ·303-in. M.G. Mark VI.

viii. Instructions for lateral adjustment of the foresight :—

(*a*) This will only be carried out by an experienced N.C.O.

(*b*) It will be carried out on the 30 yards range.

(*c*) Target.—Any target with a thick vertical line as an aiming mark, with a pencil mark $\frac{5}{8}$-inch to the right of the centre of the thick line. The latter will be invisible to the firer.

(*d*) Settling bursts will first be fired. Then a group of ten rounds will be fired by inserting a No. 3 punch between the firing lever and the safety catch. If the gun is sighted correctly, the mean point of impact will be on the thin line, *i.e.* $\frac{5}{8}$-inch to the right of the point aimed at.

If there is any lateral error, the foresight will be tapped in the same direction as the error, a No. 3 punch and a hammer being used.

Another burst will be fired after each adjustment until the sighting is correct. Adjustments are very fine and great care must be exercised in tapping the foresight. When the foresight is very tight, the bracket should be supported to prevent it being loosened.

(*e*) It is important that the socket of the tripod should be perfectly upright. After each group is fired, the aim must be carefully checked to see that the tripod has not moved.

ix. *Method of instruction.*—As for the ·303-in. M.G. Mark VI.

8. Examination of machine guns, mountings, etc.

Similar to that of the ·303-in. M.G. Mark VI, with the following exceptions :—

i. Tangent sight.—*Add* " aperture of fixed sight on stem, and aperture of slide in good condition."

ii. Rear cover.—*Add* " rear cover lock axis pin screwed home ".

iii. For " pistol grip, trigger guard and firing mechanism," *substitute* " firing mechanism ".

(*a*) Safety catch.—Automatic action of spring and catch.

(*b*) Firing lever.—(1) See that the firing lever cannot be pressed home unless the safety catch is raised.

(2) See that the trigger is released before the firing lever bears against the stop on the safety catch when the latter is raised.

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(*c*) Trigger bar and spring.—See that the spring sends the trigger bar forward quickly; inspect the trigger bar for roughness and burrs.

iv. After " Feed block " *Insert* new sub-paragraph :—

Sliding shutter, i.—The sliding shutter should not require any undue force to move by hand. If it does, look for :—

(*a*) Dirt or grit.

(*b*) Dented bottom plate, probably due to the dropping of the connecting rod on it when the lock is out of the gun.

ii. See that the catch and spring work automatically.

After " ii. Mounting " *Insert* new sub-paragraph :—

Axis pins, etc.—See that all axis pins are correct; also the chains securing the component parts.

vi. *Method and sequence of instruction.*—As for the ·303-in. M.G. Mark VI.

9. Practical handling by the gunner.

Similar to that of the ·303-in. M.G. Mark VI.

i. *Firing position of gunner.*

The following is the normal firing position to be assumed by the gunner when firing the ·303-in. M.G. Mark I mounted in the hull of the medium tank.

Sink on the right knee and sit on the right heel with the body close to the rear cross-piece. The upper part of the arms to be close to the body and the elbows as close together as possible. The left elbow may, with advantage, be rested on the left thigh.

Place the left hand on the left traversing handle with the first two fingers over the handle, the remaining two fingers and the thumb round the handle, with the thumb in a position that will form a rest for the nose.

Place the right hand on the right traversing handle with the forefinger over the handle, the second finger on the safety catch, the thumb on the thumb-piece, and the remaining two fingers round the handle.

The gun will be fired by the right hand only.

Support the head by placing the left side of the nose on the rest formed by the two fingers and thumb of the left hand, so that the line of sight is maintained.

The body should now be in a well-balanced position.

The traversing handles should not be tightly held, only sufficient grip to take up the vibration of the gun when firing is required. The vibration of the gun should be absorbed by the hands.

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APPENDIX 3

NOTES FOR INSTRUCTORS ON THE BLANK FIRING ATTACHMENT FOR THE ·303-IN. M.G. MARKS IVA, IVB OR I

1. General description.

The blank firing attachment consists of :—

i. Barrel, Mark II, marked " D.P.B." (drill purposes, blank).
ii. Cone, muzzle attachment, blank.
iii. Cups, muzzle attachment, blank.
iv. Nut, adjusting muzzle attachment, blank.
v. Screw, adjusting muzzle attachment, blank.
vi. Washers, muzzle attachment, blank, for use in armoured fighting vehicles.
vii. Spanner muzzle attachment, blank.

The barrel is specially choked at the breech, and marked " D.P.B." on the trunnion block. It replaces the ordinary service barrel when the gun is required for firing blank ammunition.

The muzzle cup assembles to the " D.P.B." barrel in the usual manner. The adjusting screw is screwed into the front cone from the rear, so that the larger end may fit into the muzzle cup.

The two claws of the muzzle attachment washer engage in any two gas vents of the outer casing. The front cone, with adjusting screw, assembles into the outer casing of the muzzle attachment in place of the existing front cone. When the cone is tightened up, the metal of the washer is punched into any one of the recesses in the front cone (which is normally for use of the combination tool), thus ensuring that the cone will not unscrew.

The adjusting nut screws on to the projecting end of the the adjusting screw and is locked against the front cone.

The spanner is designed for use on the muzzle cup, adjusting screw and nut.

NOTE.—The adjusting screw at present in use is modified, the front portion of the hole drilled through the adjusting screw being blocked up by means of a taper pin. In future manufacture the screw will be bored at the rear end only. The modified screw will be known as the Mark I*, No. 2, and new screws of the modified type as Mark I*, No. 1.

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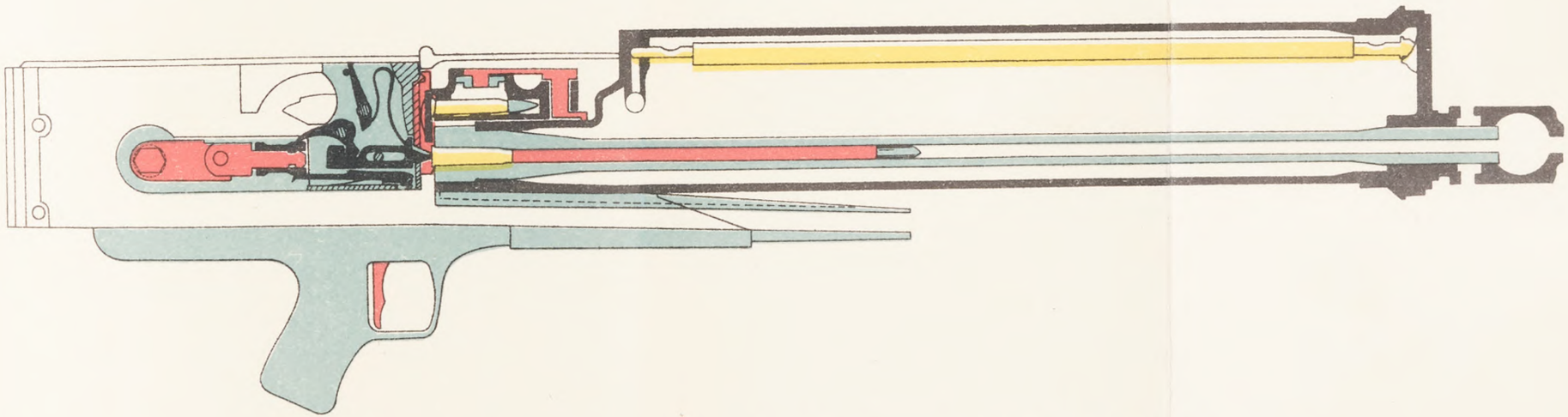
PLATE 1.

.303-IN MACHINE GUN, MARK VI

(Not to Scale)



This diagram shows the gun at the moment of firing the first shot.

NOTES:— 1. The firing pin has been released by the tail of the trigger being drawn to the rear, and has been carried forward by the long arm of the lock spring.

2. The bullet not having left the bore, the breech has not yet been unlocked.

3. A round in the feed block is gripped by the extractor ready to be withdrawn with the lock.

Malby & Sons, Lith.

1414, 3688 B, 8459, 5000, 12/96.

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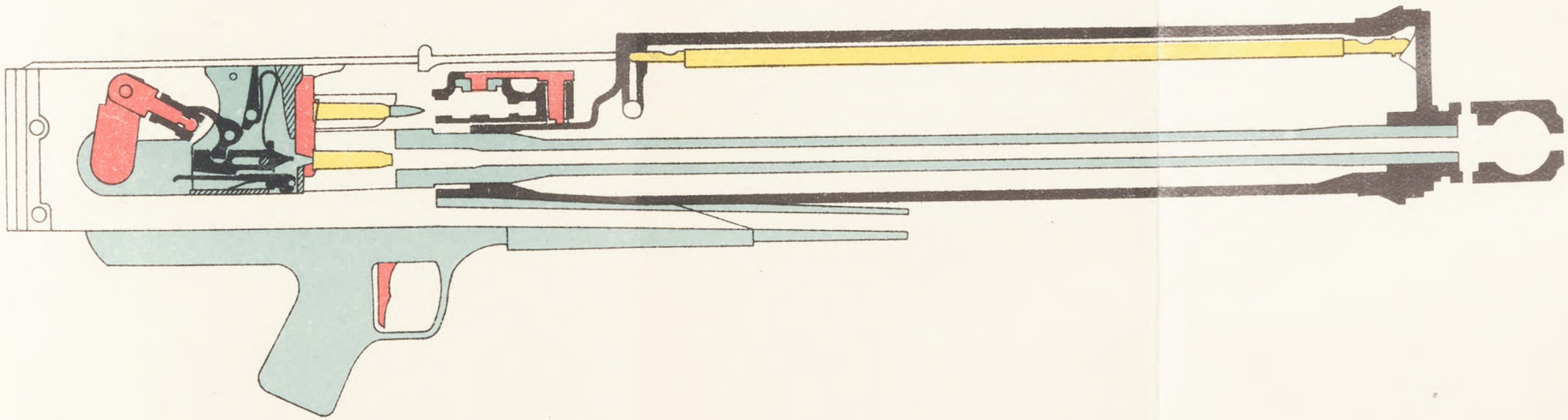
PLATE 2.

·303-IN MACHINE GUN, MARK VI

(Not to Scale).



NOTES:- 1. The recoiling portions with the exception of the lock, which still has some distance to go, are fully back.

2. The firing pin has been fully withdrawn by the side lever head raising the tail of the tumbler. Further movement of the side lever head will allow the lock spring to carry the firing pin slightly forward until the bent of the firing pin is engaged with the bent of the sear. The lock is then cocked.

3. The extractor is ready to drop.

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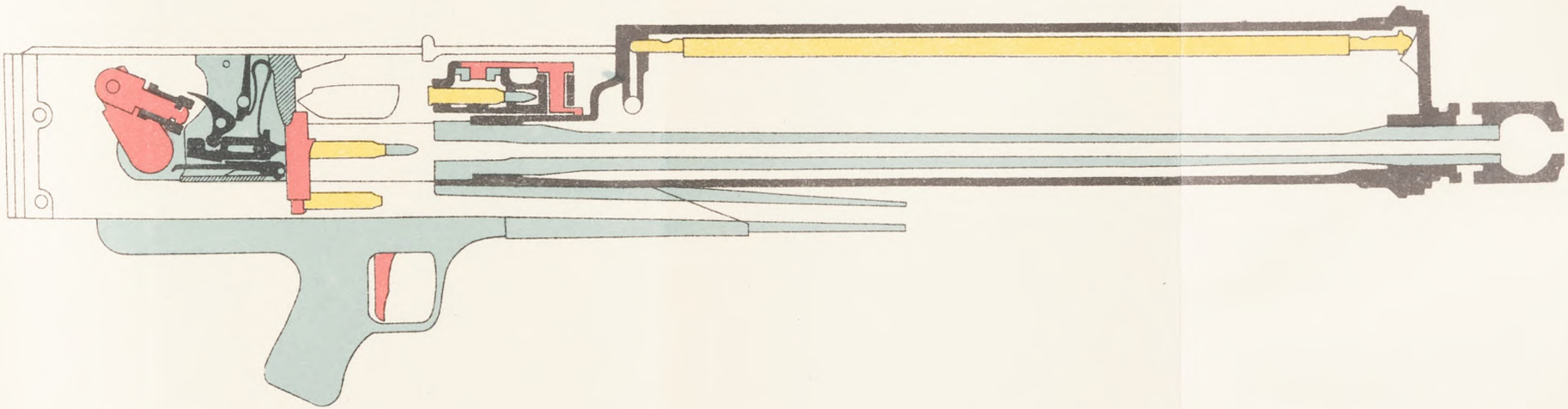
PLATE 3.

.303-IN MACHINE GUN, MARK VI

(Not to Scale).



NOTES:— 1. The recoiling portions with the exception of the lock have gone forward, and a round has been fed up in the feed block.

2. The lock has completed the backward movement and the extractor has been forced down by the ramps on the rear cover.

3. The live round is now in line with the chamber and the empty case with the ejection tube.

4. The side lever head is now clear of the tail of the tumbler and the firing pin is held by the sear.

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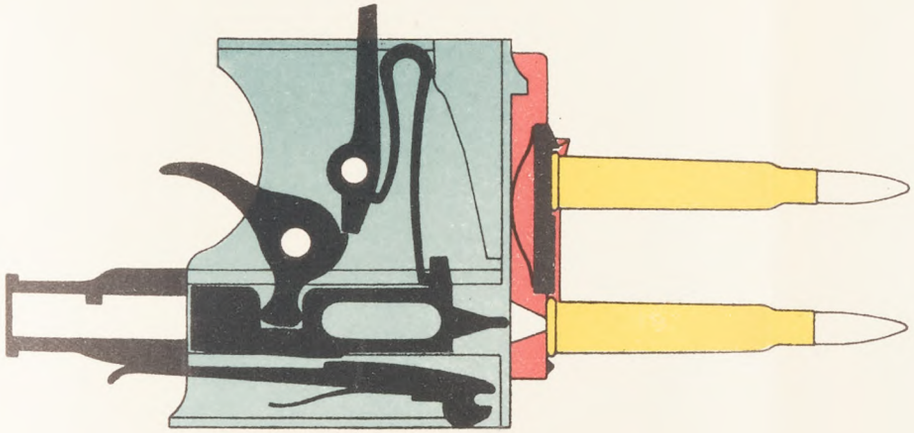
PLATE 4.

The Lock.

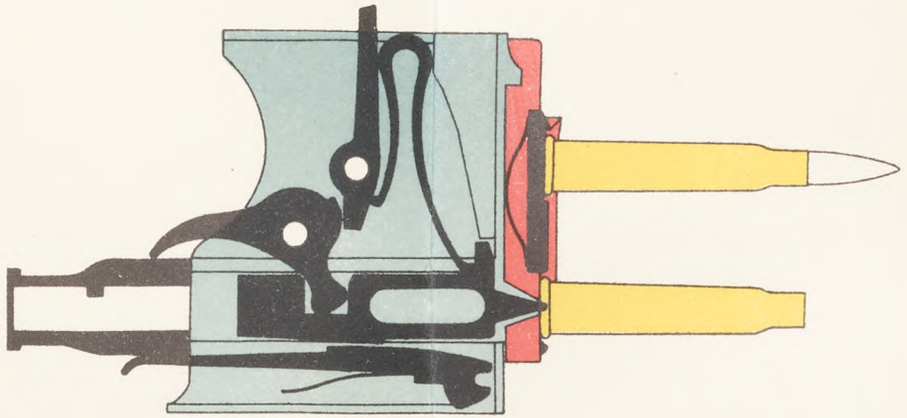
POSITION 1.



The lock cocked and ready for firing the first shot.

The side lever head has depressed the sear and the firing pin is held to the rear by the nose of the trigger engaging with the bent of the tumbler.

POSITION 2.



The lock fired.

The nose of the trigger has been released from the bent of the tumbler, thus allowing the long arm of the lock spring to carry the firing pin forward.

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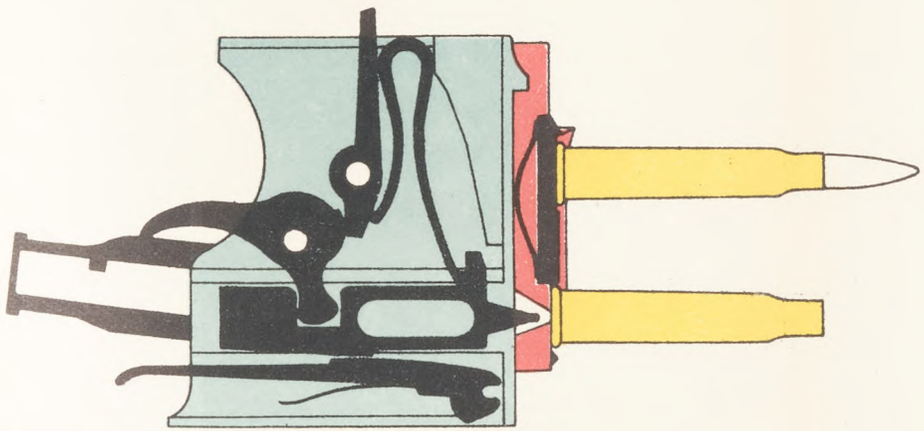
PLATE 5.

The Lock.

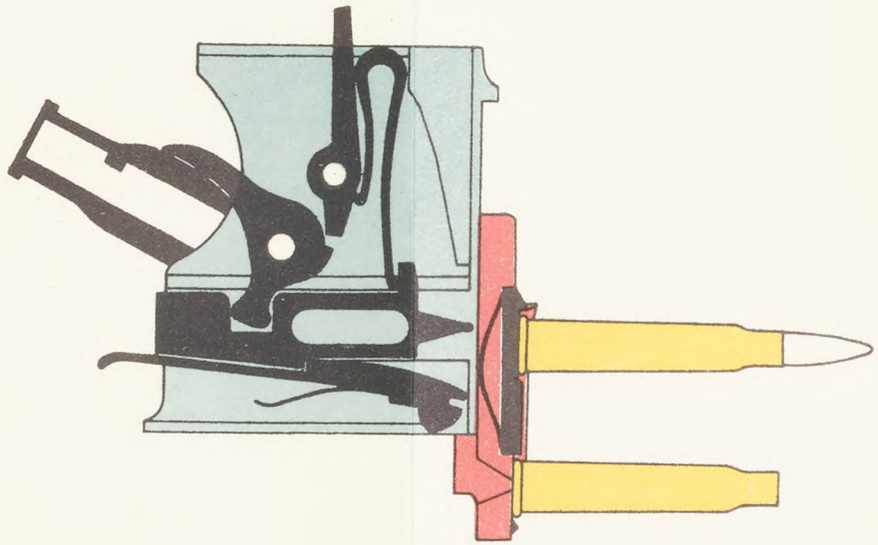
POSITION 1.



The bullet has left the bore and the crank handle rolling on the roller is unlocking the breech.

The side lever head bearing on the tail of the tumbler is withdrawing the firing pin.

POSITION 2.



The lock is back and has been cocked by the action of the side lever head on the tail of the tumbler.

The sear has been forced up by its spring until the bent of the sear is engaged in front of the bent on the firing pin.

The extractor has been forced down by the ramps on the rear cover and the live round is now in line with the chamber and the empty case with the ejection tube.

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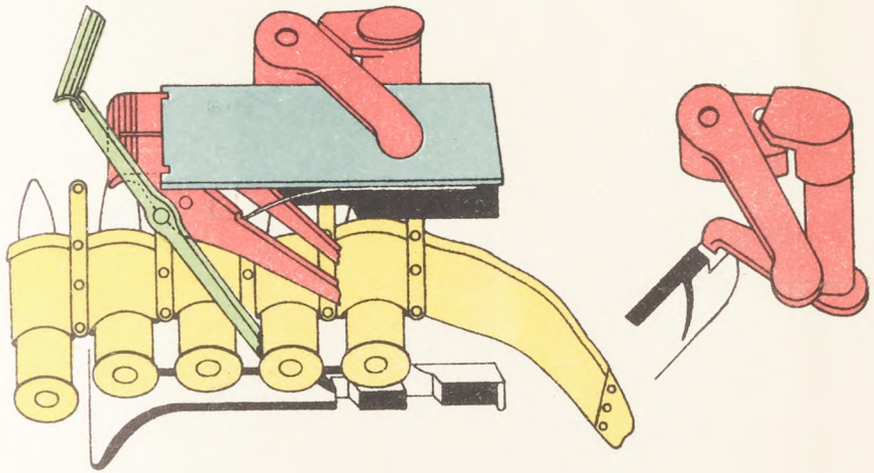
PLATE 6.

The feed pawl (left hand)

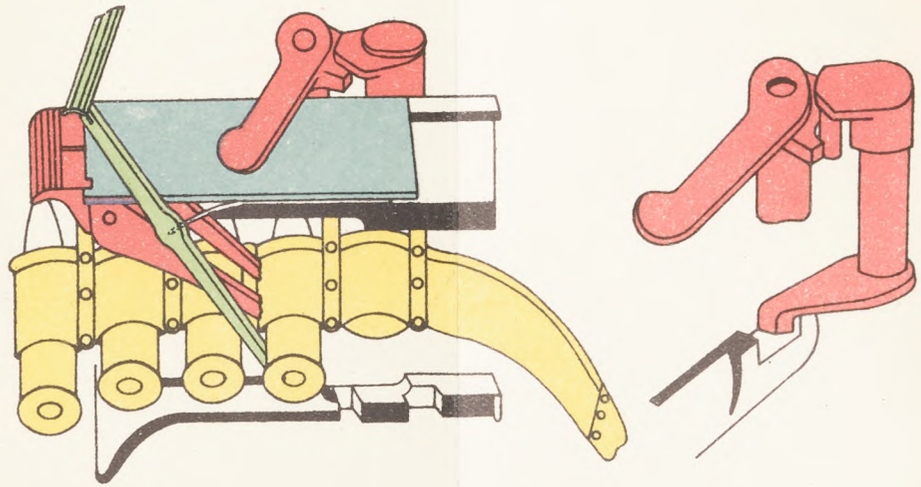
POSITION 1.



The recoiling portions are forward and the feed pawls (red) are engaged behind the first round which is in position to be gripped by the extractor as it rises.

The retaining pawls (green) are engaged behind the second round in the belt and will retain the belt in position when the first round is withdrawn by the backward movement of the lock.

POSITION 2.



The recoiling portions are back, the lower arm of the feed block has been drawn to the rear by the prolongation on the left inner side plate and the upper arm and slide have moved to the left. The feed pawls and retaining pawls are now all behind the second round. The first round has been withdrawn from the belt.

As the recoiling portions go forward, the prolongation on the left side plate carries the lower arm of the feed block forward and so forces the upper arm and slide to the right. The feed pawls being engaged behind a round carry it and the belt to the right until the round is in position with the base in the face of the feed block ready to be gripped by the rising extractor. As the belt moves to the right, the retaining pawls are forced up by the next round and allow it to pass underneath: the retaining pawl spring then forces the pawls down behind this round and prevents the belt moving to the left.

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Key to Plate 7

1. Casing, outer, muzzle-attachment, Mk. IV.
2. Ring joint, rubber.
3. Casing, barrel.
4. Boss, condenser tube.
5. Catch, front cover, Mk. II.
6. Block, feed, L.H., Mk. I*.
7. Sight, tangent, Mk. V.
8. Nut, lever, trigger.
9. Safety stop.
10. Left outside plate.
11. Catch, cover, rear, Mk. III.
12. Stud, for cheek pad.
13. Cover, rear.
14. Pin, " T," fixing rear cross-piece.
15. Gland, muzzle-attachment, Mk. III.
16. Sleeve, for ejection tube.
17. Mounting base.
18. Plug, screwed, No. 2.
19. Drip plate.
20. Trigger guard.
21. Trigger, finger, Mk. II.
22. Catch, safety.
23. Lever, loading catch.
24. Stud, for cheek pad.
25. Elevating bracket.
26. Box, fuzee spring, Mk. II.
27. Screw, adjusting, fuzee spring, Mk. II.
28. Rear cross-piece, Mk. IV.
29. Slide, No. 2, Mk. II, with fuzee spring box stud.

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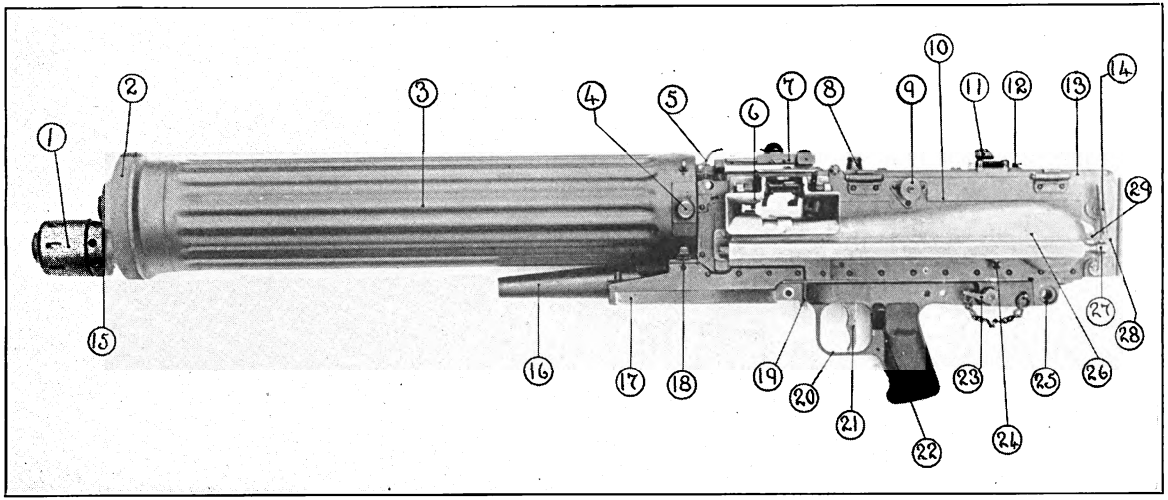

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Key to Plate 8

1. Rear cross-piece, Mk. IV.
2. Right outside plate.
3. Catch, cover, rear, Mk. III.
4. Lever, check, No. 2 or No. 2 " S."
5. Cover, rear.
6. Nut, lever, trigger.
7. Block, feed, L.H., Mk. I*.
8. Sight, tangent, Mk. V.
9. Cover, front, Mk. III.
10. Catch, front cover, Mk. II.
11. Plug, screwed, No. 2.
12. Casing, barrel.
13. Sight, fore, Mk. III.
14. Casing, outer, muzzle-attachment, Mk. IV.
15. Gland, muzzle-attachment, Mk. III.
16. Ring, joint, rubber.
17. Sleeve, for ejection tube.
18. Mounting base.
19. Drip plate.
20. Trigger guard.
21. Trigger, finger, Mk. II.
22. Layshaft bracket.
23. Pistol grip.
24. Catch, guard, trigger, Mk. II.
25. Loading catch.
26. Handle, crank, Mk. I.
27. Slide, No. 1, Mk. I, with roller, collar and No. 2 split pin.
28. Pin, joint, rear cross-piece, Mk. I.

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PLATE 8

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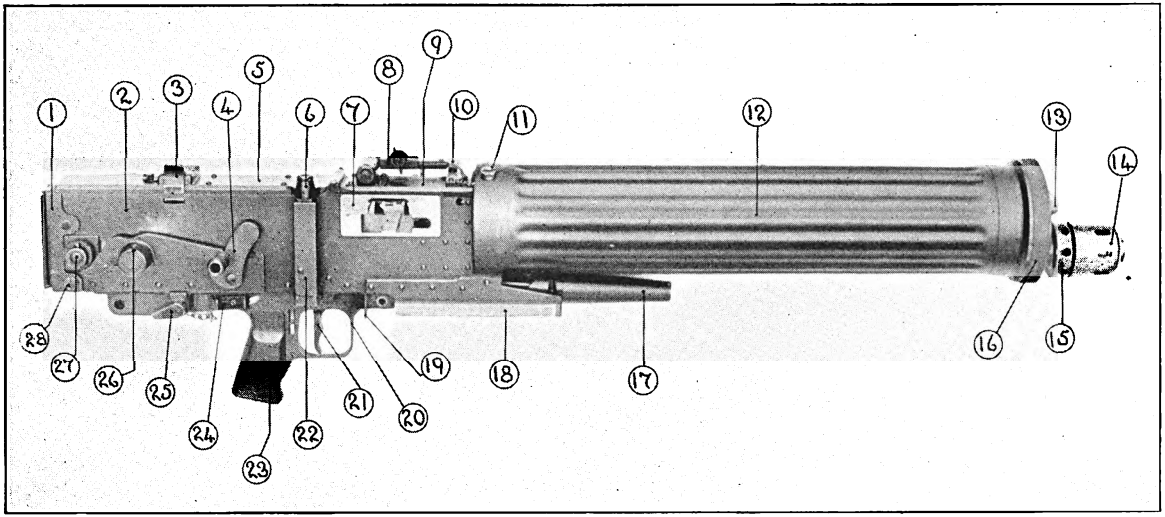

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Key to Plate 9

1. Left, outside plate.
2. Housing, for safety stop.
3. Slot, for escape of water.
4. Stud, for engagement of fuzee spring box.
5. Boss, condenser tube.
6. Groove, for joint ring.
7. Casing, barrel.
8. Hole, for filling barrel casing with water.
9. Trunnion block.
10. Mounting base.
11. Layshaft bracket.
12. Bracket, check lever, Mk. I.
13. Bottom plate.
14. Right, outside plate.

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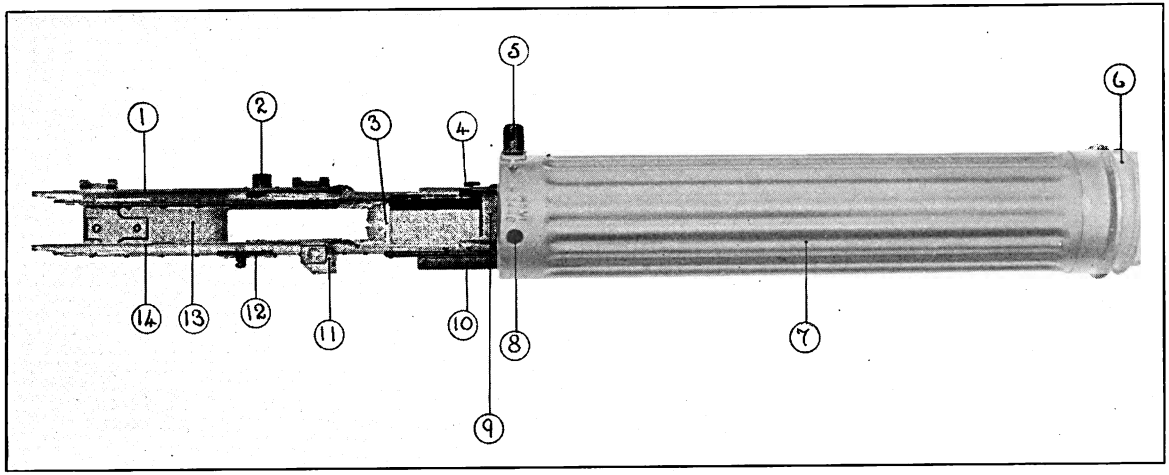

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Key to Plate 10

1. Lock, casing.
2. Upper extractor stop of lock casing.
3. Interruptions of flange in lock casing.
4. Lever, side.
5. Steps of side levers.
6. Lug of side lever.
7. Socket of side lever, for stem of connecting rod.
8. Extractor, Mk. II, No. 2.
9. Horns of extractor.
10. Recess for gib.
11. Extractor grooves.
12. Hole, for firing pin.
13. Recess for extractor detent.
14. Gib, No. 2 or 3.
15. Cover, gib spring.
16. Spring, gib.
17. Spring, detent, extractor, Mk. II.
18. Detent, extractor, Mk. II.
19. Pin, detent.
20. Lever, extractor, left, No. 2.
21. Lever, extractor, right, No. 2.
22. Bents of extractor levers.
23. Pin, firing, No. 2.
24. Bent of firing pin.
25. Projection of firing pin.
26. Trigger, lock.
27. Tumbler.
28. Bent of tumbler.
29. Head of tumbler.
30. Tail of tumbler.
31. Spring, lock.
32. Bush, axis, side lever.
33. Pin, bush, axis, side lever.
34. Pin, tumbler.
35. Pin, trigger.
36. Sear.
37. Bent of sear.
38. Spring, sear.

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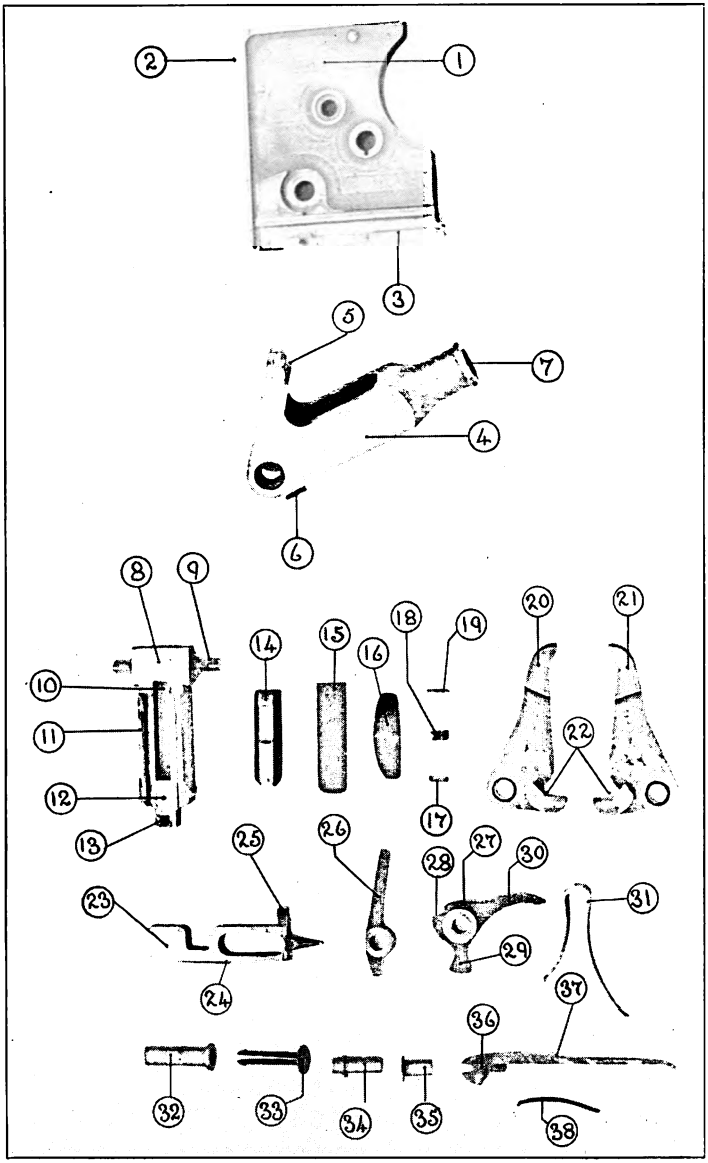

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Key to Plate 11

1. Block, feed, L.H., Mk. I*.
2. Spring, top pawl, feed block, No. 1.
3. Slide, feed block, Mk. I*.
4. Pawl, top, front, feed block, Mk. I (used as " rear " in L.H. feed block).
5. Pawl, top, rear, feed block, Mk. I (used as " front " in L.H. feed block).
6. Lever, top, L.H. feed block, Mk. II.
7. Lever, cam, L.H. feed block, Mk. II.
8. Lever, bottom, feed block.
9. Stud of bottom lever.
10. Lever, top, R.H. feed block.
11. Pawl, retaining, L.H. feed block, with tie plate.
12. Spring, pawls, retaining, L.H. feed block.
13. Pin, axis, pawls, retaining, L.H. feed block.
14. Pin, split, levers, feed block.
15. Pawl, bottom, R.H. feed block, with tie plate.
16. Pin, axis, bottom pawls, R.H. feed block.
17. Spring, bottom pawls, R.H. feed block.
18. Block, feed, R.H., Mk. I.

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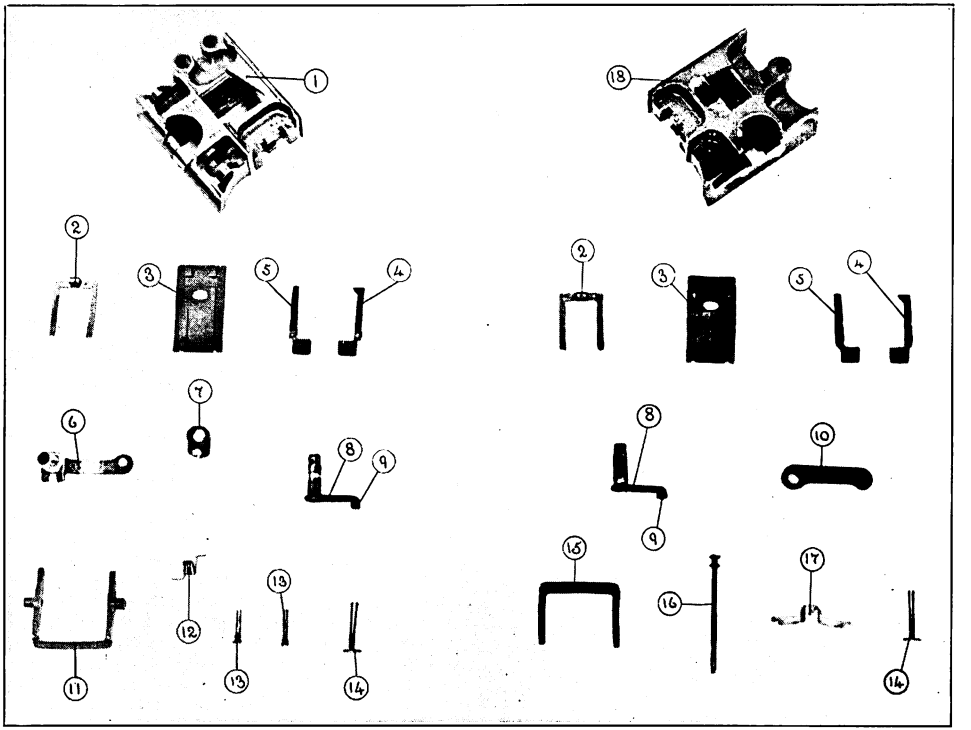

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Key to Plate 12

1. Guard trigger, Mk. II.
2. Spring, loading catch.
3. Sleeve, loading catch.
4. Screw, lever, loading catch.
5. Tube, ejection, Mk. II.
6. Side-piece, pistol grip, right. (With plain bush.)
7. Side-piece, pistol grip, left. (With screwed bush.)
8. Layshaft, Mk. II.
9. Chain M.G. with two M.G. " S " hooks, for lever loading.
10. Screw, lever, loading catch.
11. Lever, loading catch.
12. Screw, retaining, layshaft.
13. Pin, split, bush, axis, trigger guard.
14. Bush, axis, trigger guard.
15. Check, ejection tube, Mk. II.
16. Pin, check, ejection tube.
17. Catch, guard, trigger, Mk. II.
18. Spindle, loading catch.
19. Thumb-piece, trigger guard catch.
20. Trigger, finger, Mk. II.
21. Screws, catch, trigger guard. (For 19.)
22. Spring, trigger guard catch, Mk. II.
23. Guide for spring, trigger guard catch.
24. Pin, spring catch, trigger guard.
25. Screw, side-pieces, pistol grip.
26. Thumb-piece, safety catch.
27. Screw, safety catch.
28. Spring, safety catch, Mk. II.
29. Catch, safety, Mk. II.
30. Pin, axis, trigger catch, Mk. I.
31. Catch, trigger, Mk. II.
32. Spring, trigger, catch, Mk. II.
33. Spring, finger, trigger, Mk. II.
34. Guide for finger trigger spring.
35. Pin, spring, trigger, finger.
36. Lever, layshaft, Mk. II.
37. Screw, retaining, layshaft lever.

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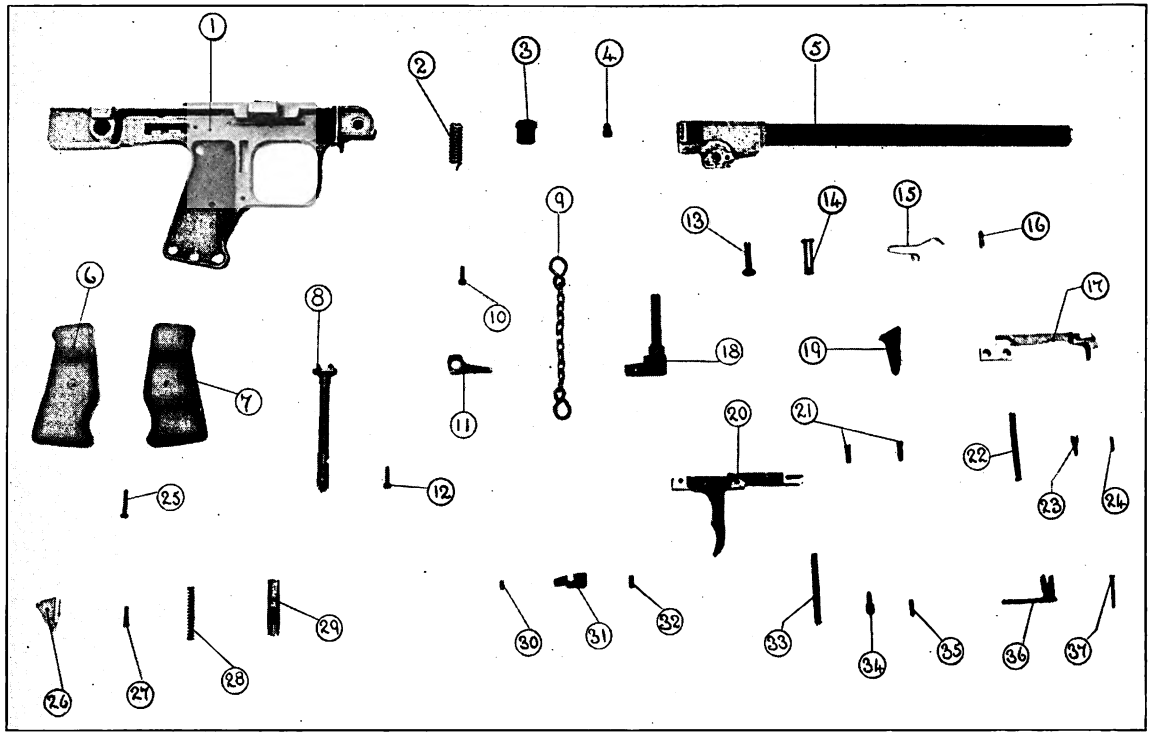

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Key to Plate 13

1. Cover, rear, Mk. V.
2. Rear cross-piece, Mk. IV.
3. Cover, front, Mk. III.
4. Pin, joint, rear cross-piece, Mk. I.
5. Nut, check, rear cross-piece.
6. Pin, split, check nut, long.
7. Catch, cover, rear, Mk. III.
8. Finger-piece, rear cover catch.
9. Spring, rear cover catch, Mk. IV.
10. Screw, finger piece, rear cover catch.
11. Pin, hinge, rear cover.
12. Pin, split, rear cover hinge.
13. Catch, front cover, Mk. II.
14. Spring, front cover catch, Mk. II.
15. Pin, axis, front cover catch.
16. Pin, split, front cover catch pin.
17. Pin, joint, cover, Mk. IV.
18. Nut, check, cover joint pin, Mk. II.
19. Pin, split, check nut cover joint pin.

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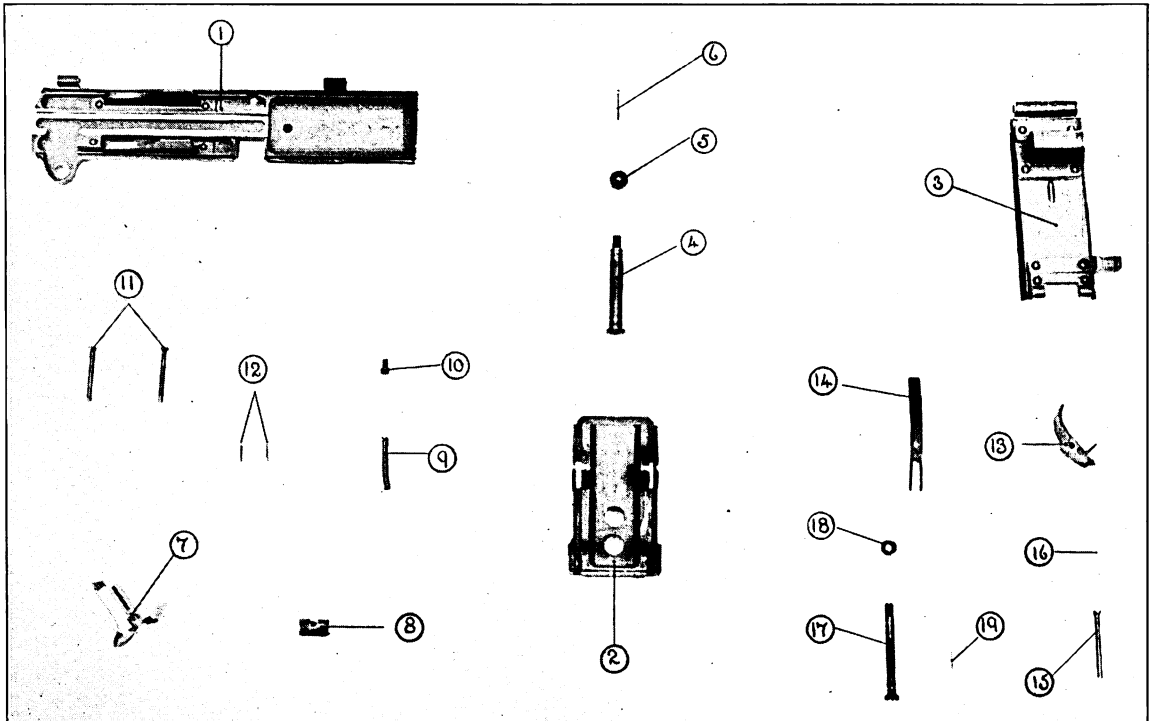

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Key to Plate 14

1. Tube, steam, No. 3.
2. Slide-valve.
3. Screw, keeper, steam tube, Mk. I*.
4. Sight, fore, Mk. III.
5. Spring, foresight.
6. Screw, foresight.
7. Pin, split, keeper, foresight screw.
8. Ring, joint. (Rubber.)
9. Lever, trigger, Mk. I*.
10. Pin, split, nut, trigger lever.
11. Spring, trigger, lever.
12. Nut, lever, trigger.
13. Lever, check.
14. Pin, keeper, check lever.
15. Pin, " T," fixing, rear cross-piece.
16. Plugs, screwed, No. 2.
17. Cap, safety stop.
18. Plunger, safety stop.
19. Spring, plunger, safety stop.
20. Detent, safety stop.
21. Slide, No. 2, Mk. II.
22. Slide, No. 1, Mk. I.
23. Roller.
24. Collar, roller.
25. Pin, split, collar, roller, No. 2.

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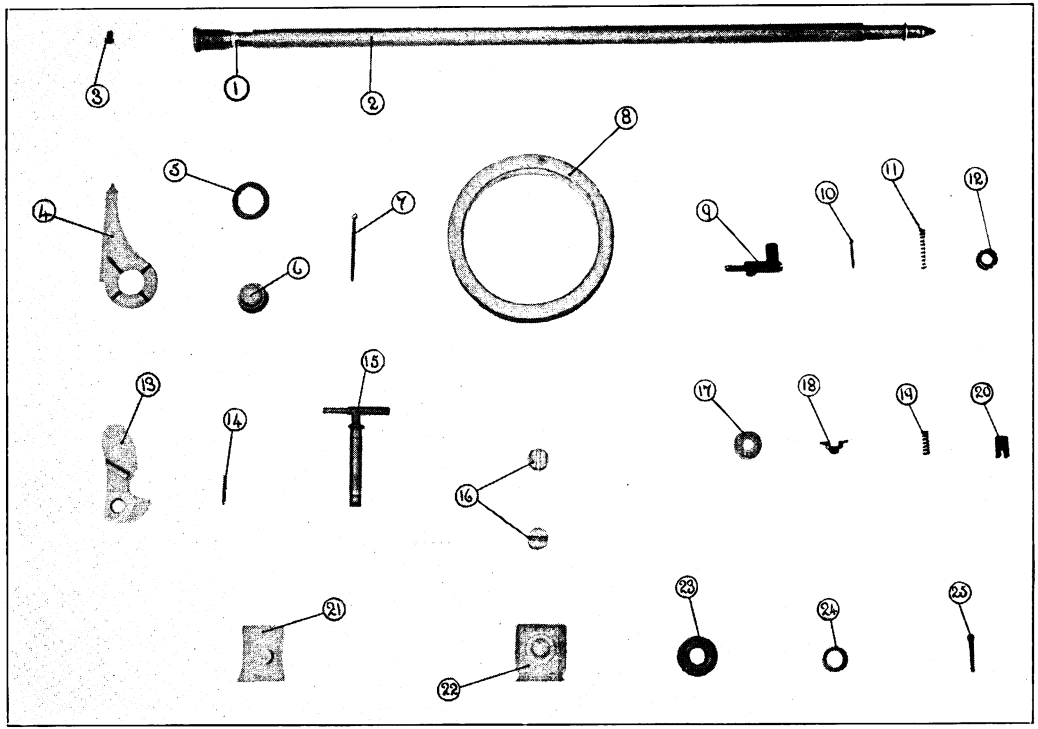

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Key to Plate 15

1. Barrel, Mk. III.
2. Box, fuzee spring, Mk. II.
3. Screw, adjusting, fuzee spring, Mk. II.
4. Sleeve, adjusting, fuzee spring.
5. Spring, fuzee, Mk. II.
6. Nut, fuzee spring, adjusting screw.
7. Pin, nut, fuzee spring, adjusting screw.
8. Fuzee, with chain.
9. Casing, outer, muzzle-attachment, Mk. IV.
10. Cup, muzzle-attachment, front.
11. Cup, muzzle-attachment, rear.
12. Gland, muzzle-attachment, Mk. III.
13. Plate, side, right, No. 1, Mk. I.
14. Plate, side, left, No. 1, Mk. I.
15. Crank, Mk. IA.
16. Rod, connecting, Mk. I*.
17. Pin, crank.
18. Pin, fixing, crank pin.
19. Nut, adjusting, connecting rod.
20. Washer, adjusting.
21. Handle, crank.
22. Pin, fixing, crank handle.

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Key to Plate 16

1. Stem, tangent sight, Mk. III, with spindle.
2. Slide, tangent sight, Mk. II* (with aperture pillar), including 14, 7, 5.
3. Pin, split, slide, tangent sight.
4. *See* 2.
5. Spring, friction slide, tangent sight.
6. Pinion, tangent sight, Mk. II.
7. Washer, slide, tangent sight.
8. Plate, graduated, tangent sight, Mk. II (for Mk. VII, graduated from 100 yards to 1,400 yards inclusive).
9. Screw, graduated plate, upper.
10. Screw, graduated plate, lower.
11. Nut, spindle, tangent sight.
12. Pin, nut, tangent sight spindle.
13. Spring, tangent sight, Mk. II.
14. Nut, slide, tangent sight, No. 2.

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PLATE 16

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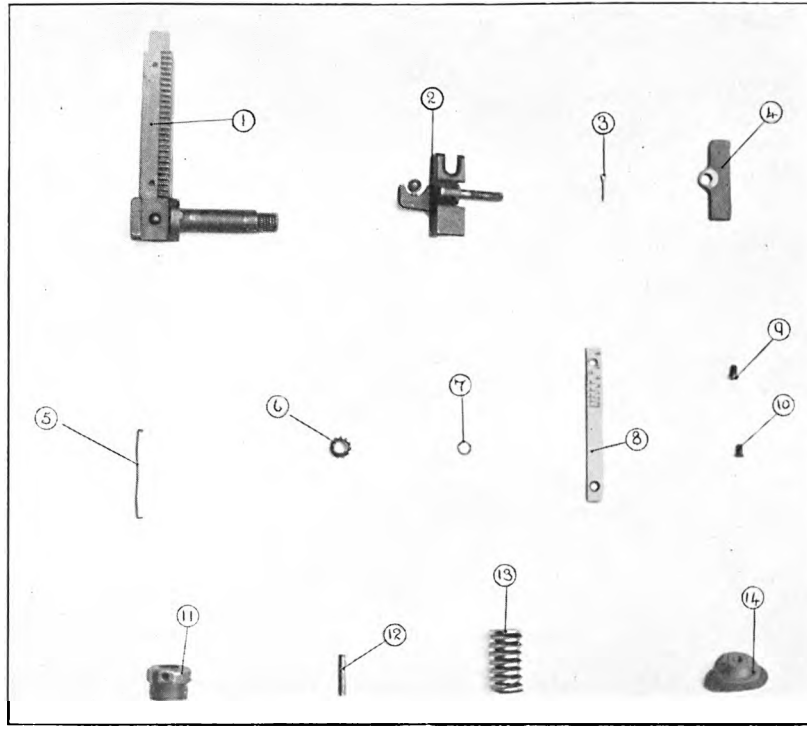

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Tank Training,

Vol. II, Part III

Pamphlet No. 3

·5-IN. VICKERS MACHINE GUNS MARKS IV AND II

1936

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TANK TRAINING, VOL. II, PART III

PAMPHLET No. 3

·5-IN. VICKERS MACHINE GUNS, MARKS IV AND II

1936

1. INSTRUCTIONAL NOTES

The following general sequences and methods of instruction are applicable to all lessons * contained in this book :—

Preparation.—The class, and everything required for the lesson, must be in position.

Demonstration.—A demonstration of the action which the lesson is intended to teach.

Explanation.—A brief description of the action demonstrated.

Imitation.—Students copy the action of the instructor.

Interrogation.—A cross-examination of students to ascertain that all points of the lesson have been understood.

It is important to note, however, that it would be incorrect in *all lessons* rigidly to adhere to this sequence. In some lessons, for example, it will be desirable to combine demonstration and explanation ; on other occasions, *imitation or interrogation* may be unnecessary. The main points to observe are that the students fully understand the purport of the lesson and, where necessary, are capable of performing any manual operation involved. Unnecessary demonstrations and explanations should be avoided and the instructor must concentrate on *practising* the student, so that the requisite degree of manual skill is attained.

Imitation may be omitted from the sequence in lessons on mechanism, and the time devoted instead to *interrogation*.

* A lesson does not necessarily represent a period of training. Some lessons may require only a few minutes.

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2. GENERAL DESCRIPTION

1. The principal differences from the ·303-in. M.G. Mark VI, apart from its size, are as follows :—

i. *Breech and barrel casing.*

(*a*) End cap.—Is fitted with a gunmetal packing gland. The gland is locked in position on the end cap by a locking piece which is attached to the cap by a keeper screw and engages the adjacent serrations in the flange.

(*b*) Steam tube, Mark II.—The arrangement of the steam tube assembly is similar to that of the ·303-in. M.G. Mark VI, except that the tube is assembled from the front of the end cap. The head of the tube is of new design and is bored to receive a baffle plug and spring loaded ball valve which regulates the escape of steam from the front of the gun.

(*c*) Trunnion block.—On the rear face of the cylindrical portion is riveted a hardened, wedge-shaped steel plate, the lower edge of which forms the engaging ledge for the front cover catch.

ii. *Outside plates.*

(*a*) *Right outside plate.*

(1) Adjacent to the feed block gap, is riveted a vertical bracket which houses the layshaft and trip gear.

(2) Safety stop, plunger and spring.—Are housed in a bracket attached to the right side of the breech casing. A bayonet jointed cap secures the plunger and spring in the bracket ; the cap is retained by two split pins.

(3) Check lever bracket.—The axis stud is longer and is drilled near its outer end to take a split pin for a collar which is employed in lieu of a keeper pin, to retain the check lever.

(*b*) *Left outside plate.*

(1) A stud is riveted at the front end on the left plate for the assembly of the bracket of the fuzee spring.

(2) The fuzee spring assembly which is attached to the left outside plate consists of :—

(i) Bracket—which hooks on to a stud riveted to the left plate.

(ii) Adjusting screw and vice pin.—The adjusting screw is threaded for approximately 2 inches and screws into the fuzee spring tube nut.

(iii) Fuzee spring tube nut.—Is threaded to receive the adjusting screw, and on the outside for screwing into the steel tube. A slot is pro-provided in the front face of the nut for the

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use of a tool for stripping purposes. The nut is drilled to admit a split pin which prevents the nut unscrewing when assembled to the tube.

(iv) Fuzee spring tube.—Is threaded internally at the front end to take the nut and is drilled to receive the split keeper pin that passes through the nut. About 2 inches from the front, four holes are drilled for the use of a tool for stripping purposes; at the rear end of the tube, on the inside, is the seating for the fuzee spring.

(v) The fuzee spring is of the compression type.

(vi) Fuzee spring rod.—The head of the rod forms the front seating of the fuzee spring; hooks are provided on the rear end of the rod to engage with the fuzee chain.

(vii) Fuzee and chain.—Is similar to that of the ·303-in. M.G. Mark VI.

The fuzee spring can be adjusted without removing the fuzee spring assembly by rotating the vice pin on the adjusting screw in a manner similar to the ·303-in. M.G. Mark VI. The fuzee spring can also be adjusted by rotating the fuzee spring tube.

(3) Fuzee guard.—Consists of an adaptor which assembles to a " T " slot cut in the left side of the resistance piece, and a bracket which carries a shield plate to which is attached a leather cheek pad that is fitted to the adaptor.

The fuzee guard is provided to protect the firer's face from the exposed fuzee.

iii. *Rear cover, Mark III.*—Clearances are made at the front end on the right hand side for the lug on the trigger bar lever and for the head of the layshaft bracket. The cover is arranged to take a sight if, and when, a sight is required.

The delay pawl, which is assembled in the hood situated at the rear end of the cover on the left hand side, can be set to slow down the action of the gun and so reduce the rate of fire.

The trigger bar, which is of the Mark III type, is assembled to the underside of the cover; it has a projecting lug at the front end for the engagement of the trigger bar lever, the lug being recessed to accommodate the free end of the trigger bar spring. A split keeper pin is provided at the front end of the cover for retaining the trigger bar.

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iv. *Trigger mechanism.*—Comprises a pistol grip and trigger guard and a two finger trigger which operates, through levers, a layshaft which in turn has a lever acting on the trigger of the lock. These details are arranged as follows :—

(*a*) Trigger guard.—Is of the central action type and assembles to the bottom place of the breech casing, where it is retained in position by a spring-loaded catch. On the right side of the guard is a bracket which carries a bell crank lever, on one end of which is a roller for engaging with the layshaft lever ; the other end of the lever passes through a slot in the side of the trigger guard and engages in a gap in a projection on the upper face of the finger trigger. The trigger spring is supported by a guide rod and has an anti-friction roller fitted into a forked end of the rod.

(*b*) Safety catch.—Is housed in the guard and comprises a plunger, a spiral spring and a knurled thumb-piece and screw. The plunger operates on the trigger. The thumb-piece is located on the left side of the guard.

(*c*) Layshaft.—Is housed in a bracket on the right side of the breech casing ; its lower end is assembled to the layshaft lever. The upper end of the layshaft is enlarged and houses the trip gear plunger and spring which controls automatic and single shot fire.

(*d*) Trigger bar lever.—Has a single arm, and is assembled below the enlarged end of the layshaft. It acts upon a lug on the trigger bar and is operated by the trip gear plunger.

(*e*) Trip gear cap.—Is cylindrical in form, and is secured to the head of the layshaft bracket on the bayonet joint principle. When in the engaged position, it is secured by a screw, and a line marked on the cap matches with the line on the layshaft bracket.

The cap carries the trip gear regulating lever for single shot and automatic fire respectively. The letter " R " (Repetition) and " A " (Automatic) are marked on the cap to indicate the required setting.

v. *Rear cross-piece.*—A hole is drilled through the centre portion to permit the inspection of the barrel.

vi. *Mounting base and ejection tube.*—The mounting base is identical in size with the ·303-in. M.G.

The ejection tube is constructed in two sections—front and rear ; the front portion is secured to the mounting base by four rivets and the rear section is secured to the barrel platform of the trunnion block by two rivets.

The rear end of the bore of the front section of the ejection tube is coned to form a seating for the cone on the front end of the rear section.

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The cartridge check, Mark II, comprises a plunger and spring housed in the underside of the tube, where it is retained by a split keeper pin.

vii. *Feed block, left or right hand.*—Has a bullet guide spring fitted at the front and a cartridge guide spring at the rear of the feed block on the inside for positioning the cartridge in readiness to be gripped by the extractor.

viii. *Barrel.*—Recesses are cut in the upper and lower surfaces of the trunnion block for the engagement and operation of the bottom lever of the right and left hand feed blocks.

ix. *Side-plates, right and left.*—Dust cover extensions are omitted. No prolongation is provided on the left side-plate.

x. *Crank.*—Differs in profile, and has a connecting rod spring riveted to the inside of the left jaw ; the spring has a nib formed on its outer end which engages a notch in the side of the connecting rod.

xi. *Connecting rod.*—Is extended beyond the bayonet joint to give greater support to the lock.

xii. *Crank handle.*—The knob of the crank handle is longer, but smaller in diameter at the neck.

xiii. *Buffer.*—Consists of a plunger, spring and bracket the latter being grooved laterally to engage the rear end of the lock guides of the right and left side-plates. The plunger abuts on the inside face of the rear cross-piece.

The buffer is provided to ensure that the barrel and side-plates are returned home ahead of the lock ; also to reduce the frictional contact of the crank on the resistance piece.

xiv. *Resistance piece, Mark II.*—Is formed in one unit with the right and left slides, and functions as the rearward stop of the crank. A " T " slot is provided on the left side to receive the adaptor of the fuzee guard. The roller, which is fitted to the right side of the resistance piece, is smaller in diameter and, by contact with the tail of the crank handle, functions only to start the rotation of the crank.

xv. *Bracket loading catch and loading catch.*

(*a*) Bracket loading catch.—Consists of a base plate which is riveted to a flanged lug bored transversely to receive the stem of the catch. A stud is provided for the attachment of an " S " hook and chain, by means of which the catch is put into operation. The bracket assembles in the grooves in the bottom plate of the breech casing, between the rear end of the trigger guard and the rear cross-piece.

(*b*) Loading catch.—Is formed with a solid head and stem, and is provided with a lever that is fitted to the end of the

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stem, and is secured by a screw. The head is shaped suitably for contact with the tail of the crank handle.

The catch is held out of engagement by a coil spring assembled on the stem; one end of the spring is connected to the catch and the other end to an adjusting sleeve. The adjusting sleeve is assembled to the bracket, and retained by a keeper screw assembled through the base plate; in the sleeve for the adjusting screw are drilled four holes, any one of which may be used as required for the adjustment of the spring tension.

2. General particulars.

Weight of gun.—

Without shoulder piece and without water	58 lb.
With No. 5 shoulder piece	64½ lb.
With No. 5 shoulder piece and water ...	73¼ lb.
Weight of shoulder piece, No. 5 ...	6½ lb.
Crank handle guard, Mark I	3 lb.

Barrel.—

Weight of barrel	7½ lb.
Length	31·10-in.
Calibre	·5-in.
Type of rifling	Concentric.
No. of grooves	7.
Direction of twist	Left hand.
Pitch	Uniform 1 in 15.
Width of lands	·08-in.
Depth of grooves	·006 to ·009-in.
Rate of fire	650–700 rounds a minute.

General.—

Muzzle velocity	2,550 ft. a sec.
How operated	1. Recoil. 2. Fuzee and buffer springs.
Ammunition	100 rounds carried in a webbing belt.

3. STRIPPING

1. General remarks.—As for the ·303-in. M.G. Mark VI, Pamphlet No. 2.

2. Removing and replacing the gun in the mounting.—Is similar to that of the the ·303-in. M.G. Mark VI.

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3. Normal stripping.—The gun having been removed from the mounting will be stripped in the following sequence :—

i. *Lock.*—Is similar to that of the ·303-in. M.G.

ii. *Pistol grip and trigger guard :—*

(*a*) Remove the " T " fixing pin.

(*b*) Remove the split keeper pin from the check nut of rear cross-piece axis pin. Remove check nut and axis pin.

(*c*) Remove rear cross-piece.

(*d*) Remove loading catch bracket.

(*e*) Disengage the spring catch of the trigger guard frame from its recess in the bottom plate, and ease the trigger guard to the rear until the flanges are clear of those on the bottom plate.

iii. *Feed block.*—Is similar to the ·303-in. M.G.

iv. *Fuzee spring assembly :—*

(*a*) To remove.—Pull the crank handle back as far as it will go, and insert the small end of the " T " fixing pin into one of the holes near the front of the fuzee spring tube, ease the crank handle on to the check lever, disengage the fuzee chain from the hooks on the rod, disengage the bracket from the stud on the left outside plate.

(*b*) To assemble.—Secure the bracket to the stud ; connect the hooks of the rod on to the fuzee chain ; pull back crank handle as far as it will go and remove the " T " fixing pin.

NOTE.—1. The " T " fixing pin must not be removed from the tube when the fuzee spring assembly has been removed from the gun.

2. To prevent damage to the connecting rod ; the rear cover will be opened before removing or replacing the fuzee spring assembly.

v. *Fuzee.*—Is similar to the ·303-in. M.G.

vi. *Recoiling portions.*—Remove resistance piece and buffer ; withdraw the side-plates and barrel.

NOTE.—When replacing the barrel the recesses in the trunnion block that have previously been in engagement with the stud on the bottom lever of the feed block will be uppermost.

The gun will be assembled in the reverse order, with particular attention, where applicable, to the points noted for the ·303-in. M.G. Mark VI.

4. Stripping the lock.—Is similar to that of the ·303-in. M.G. with the following notes :—

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i. When replacing the firing pin, it will be pushed into the lock casing until the bent of the firing pin engages with the bent of the sear.

ii. To ensure correct assembly of the lock spring, use a No. 5 punch to force it down into engagement.

5. Stripping the feed block—left or right hand.

i. Remove the split keeper pin of the top and bottom levers; separate the top and bottom levers; take out the slide with feed pawl.

Drive out the axis pin of the feed pawls; remove pawl and spring.

Remove the screwed axis pins of the retaining pawls; lift out pawl and spring.

Assemble in the reverse order, with special attention to the points noted for the ·303-in. M.G. Mark VI.

ii. Bullet guide spring.—Insert a No. 3 punch in the looped portion of the spring, by the mouth of the feed block, and pull out the spring.

When replacing the spring, force into position by hand.

6. Stripping other parts.

i. By the gunner :—

(*a*) Gland.—Slacken the keeper screw of the locking piece; lift up the locking piece, so disengaging the teeth from the serrations on the gland. Secure the locking piece in this position. Unscrew gland.

(*b*) Roller.—Is similar to the ·303-in. M.G.

(*c*) Gib and spring.—Is similar to the ·303-in. M.G.

Assemble in the reverse order.

ii. Explanation only how various parts are stripped by the armourer :—

(*a*) Steam tube.*—Place the gun on end so that it stands on the rear cross-piece. Remove the baffle plug and keeper screw positioning steam tube; unscrew and remove steam tube.

(*b*) Front cover catch and spring.*—Is similar to the ·303-in. M.G.

(*c*) Front cover.*—Is similar to the ·303-in. M.G.

(*d*) Trigger bar and spring.*—Remove the split pin retaining trigger bar; disengage the trigger bar from the interrupted flanges of the trigger bar guides and remove the spring.

(*e*) Rear cover catch, plunger and spring.*—Remove the screwed axis pin of the catch; remove catch, plunger and spring.

(*f*) Rear cover.*—Is similar to the ·303-in. M.G.

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(*g*) Delay pawl and spring.*—Remove the screwed axis pin of the pawl ; lift out pawl and spring.

(*h*) Crank handle.*—Is similar to the ·303-in. M.G.

(*i*) Check lever.*—Remove split pin, collar and check lever.

(*j*) Layshaft assembly.*—Drive out the keeper pin securing the layshaft lever to the layshaft ; remove lever and spring. Remove the screw retaining trip gear cap ; lift up the regulating lever until clear of the stop on the cap and rotate until parallel with the breech casing, then lift out. Open the rear cover, rotate the cap clockwise and lift off. Remove the layshaft complete from the housing ; remove trigger bar lever.

To remove the trip gear plunger and spring.—Drive out the retaining pin of the trip gear plunger and spring ; remove trip gear plunger and spring.

(*k*) Safety stop plunger and spring.*—Remove the two split pins from the cap of the safety stop plunger ; press in the cap and rotate until the lugs on the inside of the cap are clear of the recess in the housing and withdraw ; remove spring and plunger.

(*l*) Fuzee spring assembly.*—

(1) Remove the adjusting screw and bracket ; remove the " T " fixing pin from the fuzee spring tube, thus releasing the tension from the spring ; remove split keeper pin from the fuzee spring tube nut ; unscrew the nut ; remove rod and spring.

(2) To assemble.—Replace the fuzee spring and rod ; force in the rod until the head of the rod is clear of the holes in the tube and replace " T " fixing pin ; replace nut, keeper pin and adjusting screw and bracket.

(*m*) Buffer.*—Unscrew the head of the plunger ; remove spring and plunger.

(*n*) Pistol grip, trigger guard and firing mechanism.*—Remove screwed axis pin of the bell crank lever ; remove lever. Drive out the axis pin of the anti-friction roller ; remove trigger mechanism.

Safety catch.—Remove the screw fixing the thumb-piece of the safety catch to the plunger ; remove thumb-piece, plunger and spring.

Trigger guard catch.—Drive out the retaining pin ; remove catch and spring.

(*o*) Ejection tube cartridge check and spring.*—Remove split keeper pin from the housing ; remove plunger and spring.

(*p*) Extractor, detent, plunger and spring.*—Is similar to the ·303-in. M.G.

(*q*) Sear spring.*—Is similar to the ·303-in. M.G.

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(*r*) Loading catch.*—Remove screwed keeper pin securing the lever of the catch to the stem of the loading catch ; remove lever and loading catch. Remove the sleeve retaining screw. from the bracket plate ; remove spring and sleeve.

7. Method of instruction.—Is similar to the ·303-in. M.G. Mark VI.

4. THE MECHANISM

1. General remarks.—As for the ·303-in. M.G. Mark VI, Pamphlet No. 2.

2. The mechanism.

i. *To load.*— Is similar to that of the ·303-in. M.G. Mark VI. Method of instruction : Is similar to that of the ·303-in. M.G. Mark VI.

ii. *To fire.*—Is similar to that of the ·303-in. M.G. Mark VI. Method of instruction : Is similar to that of the ·303-in. M.G. Mark VI.

iii. *To unload.*—Is similar to that of the ·303-in. M.G. Mark VI. Method of instruction: Is similar to that of the ·303-in. M.G. Mark VI.

iv. *Action on recoil.*—Supposing the gun to have just fired the first cartridge. The extractor will be gripping the second round in the feed block, and the empty case which has just been fired, in the chamber.

The explosion will cause the recoiling portions to move backwards a distance of approximately 1 inch, thereby compressing the fuzee and buffer springs.

Method of Instruction.

To prepare the gun.

Remove the fuzee spring. Load the gun with an empty case in the chamber and a dummy round in the feed block. Fire the lock. Remove the resistance piece and spring buffer. Refix the rear cross-piece. Open the rear cover.

Demonstration.

Push back the recoiling portions from the front.

Explanation.

(1) Explosion.
(2) Recoiling portions driven backwards about one inch.
(3) Fuzee and buffer springs compressed.

Interrogation.

v. *First action in the feed block.*—As the recoiling portions travel backwards, the recess in the barrel block (right recess

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for right-hand feed block, left recess for left-hand feed blocks) carries with it the stud on the bottom lever of the feed block. The bottom lever, acting on the top lever, causes the slide and feed pawls to move to the right (left—if left-hand feed block is fitted), enabling the feed pawls to engage behind the cartridge already held in position by the retaining pawls.

Method of instruction.

To prepare the gun.

As for " Action on recoil " except that for " rear cover " substitute " front cover."

Demonstration.

As for " Action on recoil."

Explanation.

(1) Recess in barrel block.
(2) Stud on bottom lever.
(3) Bottom lever acting on top lever.
(4) Movement of slide.
(5) Feed pawls engaging cartridge held by retaining pawls.

Interrogation.

vi. *Backward rotation of crank.*—The backward movement of the recoiling portions causes the tail of the crank handle to roll on the roller, thereby rotating the crank. The rotation of the crank draws back the lock and causes the fuzee to wind the fuzee chain, thus causing the fuzee spring to be further compressed. During this movement the buffer that is fitted to the flanges of the left and right side-plates moves backward, thus forcing the plunger into its seating and compressing the spring.

Owing to the momentum of the lock, connecting rod, crank and crank handle, the webs of the crank are caused to bear against the resistance piece, this action causes the barrel and side-plates to move forward assisted by the fuzee and buffer springs, with the exception of the lock, which continues its backward movement for a short distance until the extractor is free to drop before joining in the forward movement.

Method of instruction.

To prepare the gun.

Remove the fuzee spring. Load the gun with an empty case in the chamber and a dummy round in the feed block; remove the buffer; refix the rear cross-piece and open the rear cover. (The lock is left cocked to simplify the demonstration.)

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Demonstration.

Slow demonstration by pushing back the recoiling portions from the front.

Explanation.

(1) Tail of crank handle on roller.
(2) Rotation of crank.
(3) Fuzee spring further compressed.
(4) Buffer spring compressed.
(5) Momentum of lock, etc.
(6) Webs of crank bearing on resistance piece.
(7) Barrel and side-plates travelling forward.
(8) Lock travelling still further to the rear.
(9) Barrel and side-plates home.

Interrogation.

vii. *Action of the delay pawl.*—The rate of fire is retarded by the action of the delay pawl on the left web of the crank, and is brought into effect in the following manner :—

Unscrew the adjusting screw situated on the hood; the delay pawl under the action of its spring is forced downwards. As the recoiling portions travel backwards, the left web of the crank is brought against the delay pawl and forces it upwards, compressing the delay pawl spring. The continued rotation of the crank causes the web to become disengaged from the pawl, the delay pawl spring then forces the pawl down in front of the left web of the crank, thus delaying the forward movement of the lock. The continued forward movement of the recoiling portions eventually brings the left web of the crank below the level of the delay pawl, allowing the lock to move forward under the action of the fuzee spring.

Method of instruction.—To be given in the form of explanation.

viii. *Second action in the feed block.*—As the recoiling portions travel forward, the recess in the barrel block carries with it the stud on the bottom lever of the feed block. The bottom lever acting on the top lever, causes the slide to move to the left (right—if left-hand feed block is fitted). The feed pawl being engaged behind the third cartridge in the belt carries it to the left (right—if left-hand feed block is fitted). As the base of the cartridge enters the opening in the face of the feed block, the bullet guide spring, which is compressed by the bullet of the cartridge passing through the feed block, forces the cartridge to the rear so that the groove in the base of the cartridge is clear of the feed block in readiness to be gripped by the extractor. The cartridge retaining spring during this movement has been forced upwards by the cartridge and compressed, this causes the cartridge retaining

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spring to bear firmly on to the case, so holding it in position. The cartridge is prevented from going too far to the left (right —if left-hand feed block is fitted), by the cartridge and bullet stops.

The belt, as it moves through the feed block, slides between the retaining pawls, which are forced upwards as the cartridge bears against them; when the cartridge is clear of the pawls, the retaining pawl spring re-asserts itself, causing the pawls to engage behind the cartridge, thus holding the belt in position, preventing it from sliding back after the cartridge has been withdrawn from the feed block by the extractor.

Method of instruction.

To prepare the gun.

Remove the fuzee spring, load the gun with an empty case in the chamber and a dummy cartridge in the feed block; remove the buffer; refix the rear cross-piece, push back the recoiling portions and open the front cover.

Demonstration.

Recoiling portions forced forward, and slide moving to the left (or right).

Explanation.

(1) Recess in barrel block.
(2) Stud on bottom lever.
(3) Bottom lever acting on top lever.
(4) Movement of slide.
(5) Action of feed pawls.
(6) Bullet guide spring.
(7) Cartridge and bullet stops.

Interrogation.

ix. *Backward movement of the lock.*—Is similar to that of the ·303-in. M.G. Mark VI, except that for " left horn of the extractor " substitute " right horn of the extractor."

Method of instruction.—As for the ·303in. M.G. Mark VI.

To prepare the gun.

NOTE 1.—Remove the fuzee spring at the commencement of the preparation.

2. Add—" Remove buffer."

x. *Cocking action of the lock.*—Is similar to that of the ·303-in. M.G. Mark VI.

Method of instruction.—As for the ·303-in. M.G. Mark VI.

To prepare the gun.

NOTE.—1. Remove the fuzee spring at the commencement of the preparation.

2. Add—" Remove buffer."

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xi. *Action of the fuzee spring.*—When the force of the explosion is expended, the fuzee spring takes command. The front end of the spring, bearing against its seating on the front end of the rod, forces the rod forward ; the hooks on the rear end of the rod being engaged with the fuzee chain cause the fuzee chain to unwind from the fuzee, so giving a rotary movement to the crank. This action imparts a downward movement to the connecting rod and side lever head, thereby causing the lock to move forward.

Method of instruction.

To prepare the gun.

Load the gun with an empty case in the chamber and a dummy cartridge in the feed block ; pull the crank handle to the rear ; pull the belt and open the rear cover.

Demonstration.

Allow crank handle to go slowly forward on to check lever.

Explanation.

(1) Connection of fuzee spring and chain to crank.
(2) Forward and downward movement of connecting rod and side lever head.
(3) Forward movement of lock.

Interrogation.

xii. *Forward movement of the lock.*—Is similar to that of the ·303-in. M.G. Mark VI, with the exception of the design of the ejection tube catch and spring.

Method of instruction.—Is similar to that of the ·303-in. M.G. MK. VI.

xiii. *Firing action—First shot.*—For the first shot—as the side lever head comes slightly below the horizontal, it depresses the tail of the sear, thereby disengaging the bent of the sear from the bent of the firing pin, so causing the latter to move slightly forward until the bent of the tumbler engages with the nose of the trigger.

With the regulating lever of the trip gear cap at " A " the cut-away portion on the stem of the regulating lever is so positioned that when the layshaft is rotated the fixed lug on the trip gear plunger is permitted to rotate freely.

The trigger bar lever pivoted below the head of the layshaft is retained in position by the lug at its forward end engaging between a fixed stud on the housing of the trip gear plunger and the trip gear plunger.

When the safety catch is disengaged and the trigger is pulled back, the bell crank lever being engaged with the lay-

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shaft lever causes the layshaft and trigger bar lever to rotate, thus causing the trigger bar to move backwards; the trigger bar, being in contact with the tail of the gun lock trigger, causes the latter to rotate on its axis, so disengaging the nose of the trigger from the bent of the tumbler.

The long arm of the lock spring then carries the firing pin forward on to the cap and explodes the charge.

Method of instruction.

To prepare the gun.

Load. Remove regulating lever and trip gear cap, open the rear cover. Explanation of component parts of trip gear assembly.

Demonstration.

(1) Cut lock.
(2) Firing mechanism.

Explanation.—Using skeleton lock.

(1) Bents of sear and firing pin.
(2) Lock spring forcing firing pin forward.
(3) Nose of trigger and bent of tumbler.

Using gun.—Remove the pistol grip and trigger guard to show action of trigger mechanism.

(1) Safety catch depressed and trigger pulled back.
(2) Rotation of layshaft lever.
(3) Action of trigger bar lever.
(4) Tail of trigger drawn back by trigger bar.

Using skeleton lock.

(1) Nose of trigger disengaged from bent of tumbler.
(2) Action of long arm of lock spring.
(3) Firing pin exploding charge.

xiv. *Firing action—Subsequent shots.*—Is similar to that of the ·303-in. M.G. Mark VI, except that for " trigger lever " substitute " trigger bar."

Method of instruction.

To prepare the gun.—Load, and open the rear cover.

xv. *Action inside the lock when pressure on the trigger is released.*—Is similar to that of the ·303-in. M.G. Mark VI, except that for " trigger lever " substitute " trigger bar."

Method of instruction.

To prepare the gun.—Load, and open the rear cover.

xvi. *Action of loading catch—To load.*—Is similar to that of the ·303-in. M.G. Mark VI.

Method of instruction.—Is similar to that of the ·303-in. M.G. Mark VI.

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xvii. *Firing action—Single shots.*—Unlike that of the ·303-in. M.G. the ·5-in. M.G. will be fully loaded, i.e. the extractor is gripping a live round in the chamber and one in the feed block. Firing single shots is effected by the position of the regulating lever of the trip gear.

Firing action—Single shots.—With the regulating lever set at " R " the stem of the lever is so positioned that when the layshaft rotates, the fixed lug on the trip gear plunger makes contact with the stem of the regulating lever and, as the layshaft rotates, the trip gear plunger is drawn back into its housing; during this action the trigger bar lever, being engaged with the trigger bar, causes the trigger to be withdrawn and the firing pin propelled forward on to the cap, exploding the charge. The trip gear plunger is thus fully withdrawn, so freeing the trigger bar lever from engagement with the plunger; the trigger bar spring, acting on the trigger bar, forces the latter and the trigger bar lever forward.

When pressure is released from the finger trigger the layshaft returns to its normal position. The trip gear plunger, due to the action of its spring, is forced outwards, engaging the lug on the trigger lever between the fixed stud on the housing of the trip gear plunger and the trip gear plunger.

Method of instruction.

To prepare the gun.

Load, set the regulating lever at " R," open rear cover.

Demonstration.

Press the trigger; trigger bar lever locked in position until lock is fired; trigger bar lever becomes free. Simulate the action of the trigger bar and spring by pushing the trigger bar lever forward; trigger released and re-engagement of trigger bar lever.

Explanation.—Remove regulating lever and cap.

(1) Regulating lever at " R."
(2) Trigger pressed.
(3) Lug on the trip gear plunger engaging with stem of regulating lever.
(4) Lock fired.
(5) Trigger bar lever free.
(6) Trigger bar and spring.
(7) Trigger released.
(8) Final position of trigger bar lever.

Interrogation.

xviii. *Safety devices.*—Is similar to that of the ·303-in. M.G. Mark VI.

Method of instruction.—As for the ·303-in. M.G. Mark VI.

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3. Method of instruction.

i. Object.—As for the ·303-in. M.G. Mark VI.

ii. Equipment required.—As for the ·303-in. M.G. Mark VI.

iii. Points to note.—As for the ·303-in. M.G. Mark VI.

iv. Sequence of instruction.—The following is the sequence in which instruction in mechanism will be given. Each stage should be thoroughly understood before proceeding to the next.

The method of instruction is set out for each phase :—

(*a*) To load.
(*b*) To fire.
(*c*) To unload.
(*d*) Action on recoil.
(*e*) First action in the feed block. (Left or right hand feed blocks.)
(*f*) Backward rotation of the crank.
(*g*) Action of the delay pawl.
(*h*) Second action in the feed block. (Left or right hand feed blocks.)
(*i*) Backward movement of the lock.
(*j*) Cocking action of the lock.
(*k*) Action of the fuzee spring.
(*l*) Forward movement of the lock.
(*m*) Firing action—First shot.
(*n*) Firing action—Subsequent shots.
(*o*) Action inside the lock when pressure on the trigger is released.
(*p*) Action of loading catch—To load.
(*q*) Firing action—Single shots.
(*r*) Safety devices.

NOTE.—It may be necessary to remove the front and rear packings to ensure easy movement of the recoiling portions when demonstrating.

5. STOPPAGES

1. The stoppages that occur on the ·5-in. M.G. Mark IV and the method and sequence of instruction, are similar to those of the ·303-in. M.G. Mark VI, particular attention to the following points being necessary :—

i. No. 3 position of the crank handle.—A defective bullet guide spring will give the same indication as the " Thick rimmed cartridge," and, " Damaged extractor grooves, etc."

NOTE.—The function of the bullet guide spring is to position the cartridge in the feed block, so that its rim is clear of the

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feed block in readiness to be gripped by the extractor. A faulty spring will not do this, therefore, when the extractor rises, it is unable to grip the base of the cartridge correctly, thus causing the crank handle to stop in the third position.

Should a bad fault in feed stoppage occur, difficulty will be experienced in withdrawing the recoiling portions in the method employed for the ·303-in. M.G. For guns fitted with a loading catch the following procedure will be found helpful in clearing this stoppage :—

(*a*) Pull down on the chain actuating the loading catch and pull crank handle back until the tail of the crank handle is against the loading catch.
(*b*) Place the fingers of the left hand on the feed pawls.
(*c*) Press down on the pawls and at the same time pull back the crank handle. This action causes the recoiling portions to be withdrawn and the pawls released.
(*d*) Hang the lock, remove belt from feed block, attending to the points laid down for the ·303-in. M.G.

NOTE.—If no loading catch is fitted some form of leverage will be required to withdraw the recoiling portions.

For a broken fuzee or fuzee spring, the crank handle will probably stop in the No. 3 position, giving the same indication as for " Friction on the lock." During the action of clearing the assumed " Friction on the lock " stoppage the crank handle will remain back. If this is so, complete the action of unloading ; examine fuzee spring assembly and replace defective part.

ii. In the event of the roller breaking a stoppage is unlikely to occur.

iii. Clearing the ejection tube :—

(*a*) Ensure that the gun is unloaded.
(*b*) See that the gun is pointing in the direction of the range and the usual safety precautions are observed.
(*c*) Lower the rear cross-piece and remove resistance piece and buffer.
(*d*) Hang the lock.
(*e*) Place an empty case in the breech casing, base towards the ejection tube.
(*f*) Insert into the empty case a cleaning rod or suitable object, and *press* through the ejection tube.

NOTE.—It must be emphasized that no undue force must be used in clearing the tube. In the event of a jam in the ejection tube, the following procedure will be adopted :—

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The gun will be labelled " Dangerous ; Explosive " and locked in a safe place. Circumstances permitting, a telegram should be sent at once, reporting the case to :—

C.I.S.A.,
Enfield Lock,
Middlesex.

6. BELT FILLING

1. The method of inserting the rounds in the belt is similar to that of the ·303-in. M.G. Mark VI, with the following differences :—

Insert each round into the belt by hand, as far as it will go, then, using the cartridge positioning machine, force each round into its correct position in the belt, i.e. until the front of the cartridge case is in line with the double thickness of the belt.

N.B.—The belt, when passing through the feed block, fits into a guide-way in the bottom surface of the feed block on the inside. Therefore, if the round is not correctly positioned in the belt, the base of the cartridge or tip of the bullet will foul the sides of the feed block, or the double part of the belt being too far forward in the feed block may jam in the bullet way, so causing a fault in feed.

Before firing an inspection of belts will always be carried out to ensure that the rounds are correctly positioned.

7. MAINTENANCE—GUNNERY

1. The maintenance of the ·5-in. M.G. together with the method of instruction, is similar to that of the ·303-in. M.G. Mark VI, Pamphlet No. 2.

8. POINTS BEFORE, DURING AND AFTER FIRING

1. The points to be attended to before, during and after firing, together with the method of instruction, are similar to those of the ·303-in. M.G. Mark VI, Pamphlet No. 2.

9. REPAIRS AND ADJUSTMENTS

1. General remarks.—As for the ·303-in. M.G. Mark VI, Pamphlet No. 2.

2. Testing and adjusting sights.—See Pamphlet No. 2.

3. Instructions for weighing and adjusting the fuzee spring.

i. The method of weighing the fuzee spring is similar to that of the ·303-in. M.G. Mark VI.

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ii. The fuzee spring can be adjusted by means of the vice pin, as for the ·303-in. M.G. Mark VI, or by rotating the fuzee spring tube.

iii. The weight of the fuzee spring should be between 14 and 16 lb.

4. Instructions for the renewal of packings.

i. *The cannelure.*—This is similar to the ·303-in. M.G. Mark VI, except that :—

(*a*) The weight of the recoiling portions should be between 6 and 8 lb.

(*b*) There being no bullet lead on the face of the barrel, the barrel will always be assembled in one position, i.e. the barrel number will either be at the top or the bottom.

ii. *The front packing.*—Is similar to that of the ·303-in. M.G. Mark VI.

5. Instructions for weighing the recoiling portions.—Is similar to that of the ·303-in. M.G. Mark VI, except that in addition the spring buffer is removed.

The weight of the recoiling portions should not exceed 8 lb.

6. Instructions for use of the belt repairing tool.—Is similar to that of the ·303-in. M.G. Mark VI.

7. To repair a torn belt.—Is similar to that of the ·303-in. M.G. Mark VI.

8. Method of instruction.—Is similar to that of the ·303-in. M.G. Mark VI.

10. EXAMINATION OF MACHINE GUNS, MOUNTINGS, ETC.

1. General remarks.—As for the ·303-in. M.G. Mark VI, Pamphlet No. 2.

2. Points for examination.

i. *Gun* :—

(*a*) Gland and gland locking piece.—Gland free from burrs, serrations and screw threads in good condition. Gland locking piece not damaged and engages correctly with the gland, gland locking piece keeper screw in good condition.

(*b*) Steam tube.—Head of steam tube correctly positioned and retained by its keeper screw. Baffle plug

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correctly assembled. Examine for movement of the slide valve, this can be ascertained by giving the gun a rocking motion when the movement of the valve will be distinctly heard.

(*c*) Rubber joint ring.—As for the ·303-in. M.G. Mark VI.

(*d*) Screwed plugs.—As for the ·303-in. M.G. Mark VI.

(*e*) Front cover catch.—As for the ·303-in. M.G. Mark VI.

(*f*) Rear cover.—(1) Trigger bar and spring—split keeper pin, positioning trigger bar correct; examine trigger bar for free working; test action of spring. (2) Rear cover catch—automatic fastening when cover is lowered; axis pins and keeper pins correct. (3) Delay pawl and spring—examine for correct working.

(*g*) Rear cross-piece.—As for the ·303-in. M.G. Mark VI.

(*h*) Bracket loading catch and loading catch.—(1) Bracket engages correctly in the bottom plate. (2) Loading catch working, functioning correctly; chain and " S " hooks in good order and secure.

(*i*) Bottom plate.—Flanges for the assembly of the trigger guard not damaged; examine for flaws.

(*j*) Mounting base.—As for the ·303-in. M.G. Mark VI.

(*k*) Ejection tube.—See that it is clean and free from rust; examine for correct working of cartridge check and spring. Ejection tube secure.

(*l*) Trigger guard.—(1) Safety catch working correctly. (2) Trigger mechanism, examine for flaws and burrs and see that it is working correctly. (3) Interrupted flanges not damaged, examine for flaws. Test for correct fitting to the bottom plate.

(*m*) Right outside plate.—(1) Layshaft assembly in good condition and working correctly. Trip gear cap correctly assembled; test action of trip gear. (2) Extractor safety stop—split keeper pins secure; test for free working. (3) Check lever securely held. (4) Crank handle secure. (5) Roller correctly assembled.

(*n*) Left outside plate.—(1) Fuzee spring assembly—bracket in good condition and fits correctly to the stud on the outside plate. Threads on adjusting screw in good condition. Vice pin not bent. Split keeper pin retaining screwed nut secure. Fuzee spring tube in good condition. Claws of rod in good condition, rod not distorted. Fuzee and chain in good condition, fuzee engages correctly to crank.

(*o*) Fuzee guard, correctly fitted and in good condition.

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(*p*) Barrel.—Is similar to the ·303-in. M.G. Mark VI, except that the recesses in the barrel block will be examined for burrs.

(*q*) Feed block.—Is similar to the ·303-in. M.G. Mark VI, except that the cartridge retaining spring and bullet guide spring will be examined.

(*r*) Resistance piece.—Free from burrs; engages correctly in breech casing.

(*s*) Spring buffer.—Fits correctly to flanges on inside plates.

(*t*) Lock.—As for the ·303-in. M.G. Mark VI.

(*u*) Side plates.—As for the ·303-in. M.G. Mark VI.

(*v*) Assemble the recoiling portions. Test as for the ·303-in. M.G. Mark VI.

(*w*) Fill barrel casing with water and work the recoiling portions; there should be no leakage.

(*x*) The lock will be tested in a similar manner to the ·303-in. M.G. Mark VI. The weight of the lock spring should be from 15 to 18 lb.

ii. *Mountings.*—As for the ·303-in. M.G. Mark VI.

iii. *Spare parts and tools.*—As for the ·303-in. M.G. Mark VI.

iv. *Belts and belt boxes.*—As for the ·303-in. M.G. Mark VI.

3. Method of instruction.—As for the ·303-in. M.G. Mark VI.

11. GENERAL HANDLING BY THE GUNNER

Is similar to that of the ·303 in. M.G. Mark VI, Pamphlet No. 2.

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APPENDIX

Notes for Instructors on the ·5-in. Machine Gun Mark II

1. The ·5-in. M.G. Mark II is similar to the ·5-in. M.G. Mark IV in detail and method of instruction, with the following exceptions :—

2. General description.

i. The gunmetal packing gland on the end cap is provided with a cannelure for housing a rubber joint ring. When the gun is mounted, the ring seats on a cone seating in the front of the projecting jacket and ensures a gas-tight joint. The gland is secured by a locking piece similar to that of the ·5-in. M.G. Mark IV.

The arrangements for the escape of steam are similar to the ·5-in. M.G. Mark IV, with the exception that the steam escapes through a hole on the underside of the barrel casing at the front end. A hole, adjacent to the steam escape hole, closed by a screwed plug No. 2 is provided for draining water from the barrel casing.

ii. The trigger mechanism comprises a trigger guard carrier with a detachable pistol grip, a two finger trigger which operates through levers, a layshaft which in turn has a lever acting upon the trigger of the lock. These details are arranged as follows :—

(*a*) Trigger guard frame.—Is of triangular formation, and assembles to the bottom plate of the breech casing where it is retained by a spring loaded catch. Pivoted to the right side is a bell-crank layshaft lever No. 1. Housed in the underside of the left side of the frame is a trigger guard with pistol grip which is secured by a spring loaded plunger.

(*b*) Trigger guard and pistol grip.—Is fitted with a two finger trigger, having an extension to which a spring catch is fitted for operating the No. 1 layshaft lever. A rod with a trigger return spring and collar is pivoted and housed in the groove for the trigger.

(*c*) Safety catch.—Is similar to that of the ·5-in. M.G. Mark IV, except that the thumb-piece is located on the right side of the frame.

(*d*) The layshaft, trigger bar lever and trip gear cap are similar to that of the ·5-in. M.G. Mark IV.

iii. The mounting base is similar to that of the ·5-in. M.G. Mark IV, except that it is of larger size.

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3. General particulars.

Weight of gun :—

Without shoulder piece and without water	=52 lb.
With No. 3 shoulder piece but without water	=67 lb.
With No. 3 shoulder piece and with water	=75¾ lb.
Weight of shoulder piece	=15 lb.

4. Stripping.

i. The method and sequence of stripping is similar to that of the ·5-in. M.G. Mark IV, with the following differences :—

ii. Removing or replacing the gun in the mounting.—Is similar to that of the ·303-in. M.G. Mark VI.

iii. Normal stripping.—Is similar to that of the ·5-in. M.G. Mark IV, with the following exceptions :—

No loading catch and bracket is fitted to the bottom plate, therefore, it will not be necessary to remove the rear cross-piece before the pistol grip and trigger guard can be removed. Thus the sequence for normal stripping will be : Lock—Pistol grip—Feed block—Fuzee spring—Resistance piece—Buffer—Side-plates and barrel.

iv. Stripping other parts.—Explanation only how various parts are stripped by the armourer :—

(*a*) Steam tube.*—Is similar to the ·5-in. M.G. Mark IV, except that no baffle is fitted to the head of the tube.

(*b*) Pistol grip, trigger guard and firing mechanism.*—Remove the screwed axis pin securing No. 1 lay-shaft lever to the right side of the frame Lift out trigger lever ; depress trigger guard locking plunger and remove trigger guard. Drive out axis pin, securing the finger trigger rod and spring of the trigger mechanism ; lift out trigger mechanism.

Locking plunger and spring.—Drive out keeper pin ; remove locking plunger and spring.

Safety catch and trigger guard frame catch and spring.—Is similar to the ·5-in. M.G. Mark IV.

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Vol. II, Part III

Pamphlet No. 4

MACHINE GUN MOUNTINGS AND APPURTENANCES FOR USE IN ARMOURED FIGHTING VEHICLES

1936

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TANK TRAINING, VOL. II, PART III

PAMPHLET No. 4

MACHINE GUN MOUNTINGS AND APPURTENANCES FOR USE IN ARMOURED FIGHTING VEHICLES

1936

1. MOUNTINGS M.G. NO. 2, MARK I

(For one ·303-in. M.G. Mark I in Medium tanks Marks I, IA and II)

1. The No. 2 Mark I mounting is constructed to work in a prepared position in the wall of the tank and to be manipulated by hand to cover a considerable field of fire, ranging from 20 degrees elevation to 10 degrees depression in the vertical plane and from 41 degrees right to 41 degrees left of a centre line in the horizontal plane. If necessary, the gun can be clamped at any desired angle in the vertical plane by means of a clamping handle fitted to a radial supporting arm at the breech end.

The body of the mounting is spherical in shape and fits in a corresponding socket device secured in the tank so as to form a ball-and-socket arrangement, which provides the greatest flexibility in the movement of the gun.

A jacket is provided to cover and protect that portion of the barrel casing which projects beyond the tank.

2. The principal parts of the mounting are :—

Body.
Frame, supporting body.
Ring, clamping body.
Radial arm.
Elevating gear.
Gun protecting jacket.
Clip, securing gun.
Cover, gun aperture.

3. The body is a hollow, spherical, bullet-proof steel fitting. The front and rear are opened to receive the gun,

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the front opening being somewhat irregularly shaped in the lower part to give clearance to the gun fittings in assembling or dismantling.

Just below the front opening is a cheese-headed positioning screw for the gun aperture cover. A web is formed in the interior, slightly in advance of the centre line, and shaped in the middle to support the gun, whilst on the rear face, at its lower end, a projection is formed to receive the bracket of the retaining clips.

The body is slotted longitudinally on the upper surface, to the left of the centre line, for the purpose of sighting the gun and to give clearance for the fore-sight in assembling.

4. The supporting frame is of manganese bronze and, in conjunction with a clamping ring fitted into the wall of the tank and front of the frame, forms the socket or supporting part of the mounting. The frame is secured to the tank by six bolts, each bolt having a spring washer; it is in the form of a ring with the inner surface shaped to correspond with the exterior of the body. The front surface is recessed to accommodate a flange on the clamping ring. A projection on the lower part is bored longitudinally and vertically to receive the inner end of the radial arm and its pivot pin respectively. An oil groove is cut on the upper surface of this projection for the lubrication of the pivot pin. The centre of the body coincides with the front face of the flange.

5. The clamping ring is of steel and forms the front portion of the socket supporting body; it fits in a prepared position in the port-hole of the tank and is provided on its rear face with a flange which fits partly in the tank and partly in the supporting frame, by means of which it is clamped in position. The interior surface is prepared to correspond to the contour of the body which it accommodates, and has a clearance on the front face at the lower end to permit of effective traverse at all angles of elevation. The upper part of the ring is cut away to give clearance for sighting.

6. The radial arm is of manganese bronze having the front portion bored vertically to receive a steel hinge pin by means of which it is pivoted to the supporting frame. A grub screw projects into the hinge pin to ensure its rotating with the arm. The hinge pin is bored centrally from the top to connect with a radial hole near its lower end for lubricating purposes. The rear end is forked and bored transversely to take the cross-head, which is pivoted in two slots and secured by two ball-headed trunnion retaining pins held to the radial arm by keep pins.

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7. The elevating gear is provided to form a rest or support for the breech of the gun when required. It comprises a crosshead, spindle, gun elevating link with hinge pin, and gun securing pin and bolt.

The crosshead is of manganese bronze, generally cylindrical, bored vertically for the spindle to slide in. Trunnions are formed at the upper end, which enter the grooves of the radial arm, where they are secured by the ball-headed retaining pins. A projection on the front face is cut vertically to form clamping jaws, which are operated by a steel clamping handle and screw, by means of which the spindle can be clamped to the crosshead in any desired position.

The spindle is of steel, in two parts riveted together. The lower part is tubular and fits in the crosshead, the upper part is called a connecting piece and is bored longitudinally for a steel hinge pin with washer and pin, by means of which it is secured to the gun elevating link.

The gun elevating link is of steel, forked, to fit over the connecting piece, to which it is pivoted by the hinge pin; it is bored transversely at its upper end and shaped to engage the jaws of the joint bracket of the gun. The link is secured to the bracket by a gun securing pin with handle. The pin is provided with a stop pin, which passes through a slot in the bracket to work in an enlarged recess in the end of the link and retains the bolt in position. The bolt is held to the spindle by an S-hook chain and keep pin.

8. The gun protecting jacket is of bullet-proof steel and is fitted to the barrel casing to protect it from damage by hostile fire. The jacket is tubular, made in two parts, top and bottom, riveted at the front to a steel frame, which has also riveted to it a front disc of bullet-proof steel. The two parts of the jacket are clamped front and rear to the casing by steel securing bands with clamping nuts, and the tube so formed has a leather lining in two portions.

Circumferential grooves are prepared on the exterior for the securing bands, a hole is bored in the top portion at the front for the fore-sight, whilst the front disc and bottom portion are cut away to clear the muzzle attachment of the gun.

9. The securing clip comprises a bracket, right and left catch, lever catch, lever operating catch, and spring.

The bracket is of manganese bronze bolted to the rear projection of the body; it is prepared transversely on its upper surface to receive the crosshead bracket of the gun. Two projecting arms at the rear are bored to take the spindles of the right and left catches, that on the right having a small recess to take the stop pin on the catch.

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The catches are of steel, similar in dimensions, and comprise a catch and spindle, in one piece, which are inserted in the holes of the bracket from the front. The spindles are squared on the rear to take the lever operating catch on the right and lever catch on the left, each secured by a taper pin. The catches have a bevelled boss on their inner faces which engage the crosshead joint pin holes of the gun and retain the latter in position; a spiral spring connected to the catch levers keeps them engaged. The operating catch has a thumb-piece on the right by means of which the clips can be operated.

10. The gun aperture cover is of bullet-proof steel for the purpose of closing the aperture in the body when the gun is removed. It can be fitted and removed from the inside of the tank. It is oblong in plan, curved on the front surface, with a circular ridge formed on the inner surface to fit and centre the cover in the front aperture of the body. A central boss is tapped to receive the screw stud which supports a clamping bridge, washer and wing nut. The bridge bears against the inner face of the body, the cover against the outer face, the wing nut jams the two together, thus securing the cover. A plain hole is bored on the underside to fit over the cheese-headed positioning screw of the body, by means of which the correct assembly of the cover is assured.

2. MOUNTINGS, M.G. NO. 2, MARK IA, LEFT AND RIGHT

(For one ·303-in. M.G. Mark I in medium tanks Marks IA*, II*, and IIA)

The No. 2 Mark IA left and right mountings are in Marks IA*, II*, and IIA medium tanks and are generally similar to the No. 2 Mark I mounting.

They differ from the latter only in the radial arm, which is prepared on the underside for the attachment of the No. 8 belt box carrier.

The left mounting differs from the right in that the radial arm has a hump on the left side of the hinge pin boss, which forms a stop and prevents the rear cross-piece of the gun from making contact with the inside of the vehicle.

3. MOUNTINGS, M.G. NO. 4, MARK I

(For one ·303-in. M.G. Mark I in Rolls Royce armoured cars 1920, Mark IA, and 1924, Mark I)

Consisting of a spherical body; outer body bearing ring; inner body bearing ring, with clamping screw and handle;

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pivot; pivot socket, with clamping screw and handle; gun securing pin and sleeve; gun aperture plug; two securing bolts and two securing studs.

4. MOUNTINGS, M.G. NO. 5, MARK Ia

(For one ·303-in. M.G. Mark VI or Mark IV in medium tanks Marks II* and IIa)

1. The mounting is so constructed that the ·303-in. M.G. conforms to the movement of the 3-pr. gun for elevation and depression. The gun is mounted in a cradle pivoted on trunnions and supported in a frame bolted to a bracket on the inside of the turret with the centre line 12 inches to the right of that of the 3-pr. At the rear the gun is rigidly connected to the underside of the 3-pr. cradle by means of a supporting bracket. The firing gear is arranged as an extension to that of the 3-pr., in such a manner that either of the guns, but not both simultaneously, can be fired from the one position. A bullet-proof mantlet and jacket are provided for the protection of the mounting and projecting portion of the barrel.

2. The principal parts of the mounting are :—

Cradle.
Gun protecting jacket.
Elevating gear.
Mantlet.
Firing gear.

i. *The cradle* is of manganese bronze; it has an opening at the front end through which the gun passes and two trunnions which rest in bearings in a frame bolted to the turret bracket. Four holes at the front are countersunk for the screws which secure the mantlet to the cradle, and a stop, secured by a screw, limits the forward movement of the gun when it is being mounted in the cradle. The upper side of the rear end is flat and is formed with two raised bearing strips upon which the gun rests. To prevent upward movement of the gun a dovetailed groove is formed on the left side whilst the right side is faced to receive a dovetailed clamping strip. Holes are drilled through the cradle and strip for a hexagonal-headed clamping screw, the nut for which is retained by a screw on the underside of the cradle. Two small springs contained in recesses in the strip cause the latter to lift and release the gun when unclamped. A clamping spanner is housed in a clip on the right side of the supporting frame. At the rear end of the cradle on the underside is a boss drilled to receive a recoil pin with spring and having a bayonet joint slot for the

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locating stud of the pin; the pin, when down permits the gun to be mounted or withdrawn and, in the raised position, prevents its movement to the rear.

ii. *The mantlet* is of bullet-proof steel, rectangular in shape with the upper and lower surfaces formed convex. Four holes are tapped on the rear for the attachment of the mantlet to the cradle and a semi-circular slot is cut on each side near the base to allow the mantlet to fit over the trunnion between cradle and supporting frame. The front end is faced for the attachment of the protecting jacket and tapped for four securing screws.

A circular hole through which the gun protrudes has a slot cut in the bottom for the ejection tube. A hole is drilled on the top on the right-hand side. This hole coincides with a similar hole in the top transom of the supporting frame when the mounting is at 10 degrees elevation; in this position the mounting can be locked by inserting the handle portion of the gun securing pin.

iii. *The gun protecting jacket* is a cylinder of bullet-proof steel with a square flange at the rear for attachment to the mantlet. It has a tubular opening in the base to permit ejection of the fired cartridge cases from the gun. A hole at the front through which the muzzle projects is provided with a semi-circular cover formed on the jacket.

Two marks of jackets are in the service, viz. Marks I and II. The Mark II differs from the Mark I in being approximately 4 mm. thicker and in having countersunk boss-headed securing screws in lieu of hexagon-headed screws. The Mark I jacket is distinguished by a band, one inch wide, painted in white around it near the flange.

iv. *The elevating gear* comprises a supporting bracket and adjusting link, but apart from this adjustment it provides for no movement between the machine gun and 3-pr. mounting.

v. *The supporting bracket* is of manganese bronze with a curved horizontal arm and a vertical projection. It has a flange partly concave with two flat seating faces formed on the concave portion for fitting to the 3-pr. cradle, to which it is secured by four screws; this forms a rigid connection between the two mountings. The vertical projection receives the axis pin of the cranked firing lever below which is a horizontal hole fitted at each end with a ball bearing retained by a nut to carry the actuating shaft.

A lever is fitted and secured by a nut to each end of the shaft; at the rear end a short curved lever projects vertically to engage the short arm of the firing lever; at the front end

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a long curved lever also projects vertically. A long and short rod connected by a turnbuckle connects the long lever to the change mechanism of the 3-pr. mounting. On the side of the vertical projection is fitted a small angle bracket carrying a hinge piece with hinge pin and loop, these form a retainer for the safety catch of the machine gun.

vi. *The adjusting link* comprises an upper and lower screw, with right and left hand threads respectively, connected together by a double-ended adjusting nut; a lock nut is provided on each screw. The lower screw is connected by a joint pin to the supporting bracket, and the upper screw is similarly jointed to the elevating bracket on the underside of the machine gun. Each pin has a feather to prevent it from working out; the lower pin has a roughened thumb and finger grip.

vii. *The firing gear* is operated by the firing grip of the 3-pr. mounting, the action of the firing gears being common up to the rotation of the firing lever shaft.

When the selecting sleeve is placed in the forward position, by means of a change lever, it connects the firing lever shaft to a small lever which is connected to the machine gun firing gear rod. The rotation of this lever pulls the firing gear rod to the left thus operating the long actuating lever which rotates the actuating shaft. The short lever at the rear end of the shaft engages the short arm of the firing lever, which is rotated. The long arm of the lever is fitted with a plunger which can be pushed inwards against the pressure of a spring, and is retained by a screw working in a bayonet slot. The outer end of the plunger makes contact with the trigger of the machine gun and fires the gun. It is important that the plunger should be pushed in out of the way of the machine gun when mounting or dismounting the latter.

5. MOUNTINGS, M.G. NO. 5, MARK II

(For one ·303-in. M.G. Marks VI or IV in medium tanks Mark IA*)

1. The mounting is so constructed that the ·303-in. machine gun conforms to the movement of the 3-pr. gun for elevation and depression. The gun is mounted in a cradle pivoted on trunnions supported in a frame bolted to a bracket on the inside of the turret with the centre line 13·125 ins. to the right of that of the 3-pr. At the rear the gun is connected to the right side of the 3-pr. cradle by means of a supporting bracket.

The firing gear is arranged as an extension to that of the 3-pr. in such a manner that either of the guns, but not both

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simultaneously, can be fired from the one position. A bullet-proof mantlet and jacket are provided for the protection of the mounting and the projecting portion of the barrel.

2. The principal parts of the mounting are :—

Cradle.
Gun protecting jacket.
Elevating gear.
Mantlet.
Firing gear.

i. *The cradle,* of manganese bronze, has an opening at the front end through which the gun passes and two trunnions which rest in bearings in a frame bolted to the turret bracket. Four holes at the front are countersunk for the screws which secure the mantlet to the cradle. At the front a stop secured by a screw limits the movement of the gun to the front when being mounted in the cradle. The bottom of the body is flat and is formed with a dovetailed clamping plate. Holes are drilled through the cradle and a strip for a hexagonal-headed clamping screw, the nut for which is retained by a screw on the underside of the body. Two small springs contained in recesses in the strip cause the latter to lift and release the gun when unclamped. A clamping spanner is housed in the clip on the right side of the supporting frame. At the rear end of the cradle on the underside is formed a boss drilled to receive a recoil stop pin with spring, and having a bayonet joint slot for the locating stud of the pin ; the pin when in the lowered position permits the gun to be mounted or withdrawn, and in the raised position prevents its movement to the rear.

ii. *The mantlet* is of bullet-proof steel, rectangular in shape with the upper and lower surfaces formed convex. It is secured by screws to the cradle, and a semi-circular slot is cut on each side near the base to allow the mantlet to fit over the trunnions between cradle and supporting frame. The front is prepared for the attachment of the protecting jacket, and a semi-circular hole through which the gun protrudes has a slot cut in the bottom for the ejection tube.

A hole is drilled in the top on the right-hand side. This hole coincides with a similar hole in the top transom of the supporting frame when the mounting is at 10 degrees elevation. In this position the mounting can be locked by inserting the handle portion of the gun securing pin.

iii. *The gun protecting jacket* is a cylinder of bullet-proof steel with a square flange at the rear for attachment to the mantlet. It has a tubular opening in the base to permit of the ejection of fired cartridge cases from the gun. A hole at the front

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through which the muzzle projects is provided with a semi-circular cover formed on the jacket.

Two makes of jackets are in the Service, Marks I and II. The Mark II differs from the Mark I in being approximately 4 mm. thicker and having countersunk boss-headed in lieu of hexagon-headed securing screws. The Mark I jacket is distinguished by a band, one inch wide painted in white around it near the flange.

iv. *The elevating gear* comprises a supporting bracket and adjusting link, but apart from this adjustment it provides for no independent movement between the machine gun and 3-pr. mounting.

v. *The supporting bracket* is of manganese bronze with vertical and horizontal arms. The former has two flat seating faces fitting against the right side of the 3-pr. cradle, to which they are secured by screws and bolts. This forms a rigid connection between the two mountings. The arm is faced on the upper side and prepared for the attachment of the firing lever bracket, and on the outer side two lugs form the pivot of the long vertical lever of the firing gear. A vertical projection about the middle of the supporting bracket receives the pivot pin of the firing gear cranked lever, below which is fitted a bracket with a hinge pin and stirrup forming a retaining catch for the safety catch of the machine gun.

The horizontal arm is fitted at the outer end with the lower joint pin of the adjusting link. A gun-metal guard, to protect the long vertical lever of the firing gear, is fitted to the bracket by two bolts.

vi. *The adjusting link* comprises an upper and lower screw, the shank being formed with right and left-handed threads respectively, and connected together on a double-ended adjusting nut with lock nuts. The lower screw is connected by a joint pin to the supporting bracket, and the upper screw is similarly connected to the eyes on the underside of the machine gun. The joint pins each have a dowel pin to prevent their working out.

vii. *The firing gear* is operated by the firing grip of the 3-pr. mounting, the action of the firing gears being common up to the rotation of the firing lever shaft. When the selecting sleeve is placed in the forward position by means of the change lever, the firing lever shaft is connected to a small lever which is in turn connected to the machine gun firing gear link. The rotation of the small lever pulls the firing gear link and thereby the top end of the actuating lever to the left; and the lever being pivoted, the lower end engages the front arm of the

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firing lever and rotates it. The long arm of the firing lever is fitted with a bayonet jointed spring loaded plunger, the outer end of which makes contact with the machine gun trigger to fire the gun. The plunger must be pushed inward to clear the trigger when the gun is mounted or withdrawn.

6. MOUNTINGS, M.G. NO. 5, MARK III

(For one ·303 in. M.G. Marks VI or IV in medium tanks Mark III)

1. The principal parts of the mounting are :—

Cradle.
Cradle supporting frame.
Mark II mantlet.
Gun supporting bracket.
Mark I safety catch retainer.
Spanner.

i. *The gun supporting bracket.*—The projecting portion carrying the firing lever is located closer to the centre line of the bracket and, consequently, the portion carrying the adjustable link is further from the centre line.

ii. *The elevating bearing bracket* differs slightly in dimensions and the spanner is housed at an angle.

iii. *The firing gear.*—The short actuating rod is cranked instead of straight..

iv. *The mantlet and transoms.*—The holes in the mantlet and upper transom for locking the mounting at 10 degrees elevation, are on the left instead of on the right. In addition to being secured to the elevating brackets both the upper and the lower transoms are secured also to the turret.

v. *The gun protecting jacket Mark III* differs from the Mark II jacket in the location of the bolt holes, and the securing screws are $\frac{1}{2}$-inch with hexagon head instead of $\frac{7}{16}$-inch with countersunk boss-head.

7. MOUNTINGS, M.G. NO. 6, MARK I

(For one ·303-in. M.G. Marks VI or IV and one ·5-in. M.G. Mark II in Lanchester armoured cars Marks I and IA)

1. The principal parts of the mounting are :—

Cradle Mark I.
Left and right elevating bearings.
Lower and upper anti-splash plates, Mark I.
Mantlet.

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Left and right mantlet end covers.
Brake.
Mark I telescope holder.
Mark I brow pad.
Arm and bracket.
Mark II (or Mark I). ·303-in. and Mark II (or Mark I) ·5-in. gun protecting jackets.
Spanners for one ·303-in. M.G. Mark VI or IV and one ·5-in. M.G. Mark II.

2. Detail.—Mountings, M.G. No. 6, Mark I are of dual and free elevation type and are arranged for a maximum of 30 degrees elevation and 15 degrees depression; traverse is attained by movement of the turret.

i. *Elevating bearings.*—Secured to the turret.

ii. *The cradle* is of manganese bronze; has an opening for the ·5-in. gun on the right and another on the left for the ·303-in. gun, also trunnions which engage the afore-mentioned bearings. The cradle bottom under each gun opening is suitably arranged to receive and clamp the dovetailed mounting base of each gun. A "T" headed recoil pin for each gun is fitted vertically in the underside of the cradle to engage in the gun mounting base. A spanner is housed in a clip on the rear face of the cradle and secured by a chain and screwed eye.

iii. *The mantlet* is of bullet-proof steel; is secured to the front of cradle; has openings for the telescope, guns and gun ejection tubes.

iv. *The anti-splash plates.*—Two curved plates of bullet-proof steel are secured to the turret, one above and one below the mantlet, as a protection against bullet splash.

v. *The gun protecting jackets.*—Two cylindrical jackets of bullet-proof steel are bolted to the front of the mantlet through square flanges at their rear ends. At the bottom of the flanges are openings to permit the ejection of fired cartridge cases. At the front end of each jacket is an opening with a semi-circular head above it through which the gun muzzle protrudes. The ·5-in. gun jacket has a smaller head than the ·303-in. gun and also a steam escape hole. Jackets of early manufacture, known as Mark I, were 8 mm. in thickness (approx.). No more of these will be made; for identification purposes a one-inch white line will be painted around the Mark I jackets near the flanges. The Mark II patterns differ from the Mark I only in that they are approximately 4 mm. thicker and in the pattern of the securing screws.

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vi. *The mantlet and covers* are of bullet-proof steel; one right and one left; are secured to the outside of the turret to cover the open sides of the mantlet where it projects through the turret.

vii. *The brake* is fitted by means of a boss on the lower shoe to a bracket on the turret, and consists of two shoes, lined with asbestos, which fit round a drum secured to the left trunnion of the cradle, where it projects through the bearing. A bolt with a knurled adjusting nut is provided to adjust the tension.

viii. *The telescope and holder Mark I* consists mainly of a body portion and two brackets. The body has semi-circular ends, with hinged caps and spring bolts with knurled clamping nuts, to clamp the telescope. It pivots horizontally at its front end and is secured to an adjustable bracket which pivots vertically on a supporting bracket secured to the cradle. Two adjusting screws are provided to permit of adjustment.

ix. *The Mark I brow pad, arm and bracket.*—The brow pad consists of a " sorbo " rubber pad, secured to a curved gun-metal plate by copper wire; the plate is fixed by a screw to an arm bent at right angles, which is slotted to permit lateral adjustment of the plate, a bracket in the form of a hinged clamp for fixing to the telescope has a projecting portion through which the brow pad arm is fitted and retained by a clamping screw.

8. MOUNTINGS, M.G. NO. 6, MARK I*

(For one ·303-in. M.G. Marks VI or IV and one ·5-in. M.G. Mark II in Lanchester armoured cars Marks I and IA)

1. The No. 6 Mark I* mounting is the No. 6 Mark I, modified by the fitting of Mark II adjustable bracket and a Mark II brow pad and arm (identical with those on the No. 6, Mark IA mounting) to the Mark I telescope holder.

9. MOUNTINGS, M.G. NO. 6, MARK IA

(For one ·303-in. M.G. Marks VI or IV, and one ·5-in. M.G, Mark II in Lanchester armoured cars Marks II and IIA)

1. Consisting of :—

Cradle.
Mark II left and Mark I right elevating bearings.
Lower and upper anti-splash plates.
Mark II mantlet.

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Left and right mantlet covers.
Brake.
Shutter.
Mark II telescope holder.
Mark II brow pad and arm.
Mark II (or Mark I) ·303-in. and Mark II (or Mark I) ·5-in. gun protecting jackets and spanner.

2. Differs from the Mark I pattern in the following respects :—

i. *The brake* is fitted by means of the hinge pin to the bracket, cast integral with the base of the left bearing. The adjusting nut is fluted instead of knurled.

ii. *The telescope holder Mark II.*—The body has a stop cast integral with it which, in conjunction with a similar stop on the front cap, limits the opening of the latter, the spring clamping bolts having wing nuts instead of knurled; the adjustable bracket has an extension at the rear fitted with a clamping screw for carrying the brow pad arm. The adjusting screws have hexagon heads instead of knurled.

iii. *The Mark II brow pad and arm.*—The brow pad is identical with that on the No. 8 mounting. The arm has recesses for engagement of the clamping screw.

iv. *The clamping spanner* is double ended.

v. *The mantlet and shutter.*—A sliding shutter for covering the telescope aperture is fitted to the mantlet. It consists of a bracket carrying a sliding shutter plate having a projecting lip at the bottom to serve as a handle. A stud on the plate engages a cross-bar on the bracket and forms a stop. A spring plunger in a boss on the cross-bar retains the shutter.

10. MOUNTINGS, M.G. NO. 7, MARK I

(For one ·303-in. M.G. Marks VI or IV in Marks I and II Lanchester and six-wheeled Crossley armoured cars)

1. Consisting of a cradle (in two parts); left and right elevating bearing brackets; two inner and three outer anti-splash plates; shield with bracket; one Mark I lower, and two upper filling-in plates; four anti-splash strips; elevating block; Mark I mantlet; Mark I telescope holder; Mark I brow pad, arm and bracket; Mark II (or Mark I) gun protecting jacket and spanner.

2. Detail.—This is of gimbal type, and arranged for a maximum of 25 degrees elevation, 10 degrees depression and 22½ degrees right and left traverse.

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i. *The right and left elevating bearing brackets* are bolted to the hull of the car. A split boss on the right bracket is fitted with a clamping screw. A thin anti-splash strip secured on the rear face of each bracket. A clamping spanner and clamping key are housed in clips on the right-hand bracket and secured by chains with screwed eyes.

ii. *The elevating block* consists of right and left trunnion plates connected by lower and upper traversing bearing plates. The trunnion plates, which engage bearing holes in the elevating brackets, are curved to clear the mantlet, and are fitted with stops to limit the travel of the gun cradle. A split boss on the upper traversing bearing plate is fitted with a clamping screw. A thin anti-splash strip is secured on the rear face of each bearing plate.

iii. *The cradle* is of manganese bronze, in two parts, Part I (the front portion) has a central gun opening and, near the top on the left-hand side, an aperture for the telescope. At the bottom and top are trunnions which engage in bearing holes in the lower and upper traversing bearing plates of the elevating block. Part II (the rear portion) is secured to Part I by four bolts. The bottom, under the gun opening, is arranged to receive the dovetailed mounting base of the gun similarly to that for the No. 6 mounting, but for one gun only.

iv. *The mantlet*, of B.P. steel, is secured to the front of the cradle, has a central gun opening and a telescope aperture on the left-hand side near the top. Below the gun opening is a circular clearance for the gun ejection tube.

v. *The anti-splash plates*.—Two curved plates of manganese bronze are secured to the inside of the turret, one below and one above the mantlet. Two short vertical plates and one horizontal plate of bullet-proof steel are secured to the outer side of the turret to prevent bullet splash from penetrating between the lower part of the elevating block and turret.

vi. *The telescope holder, Mark I* is attached to the gun cradle at the rear of the telescope aperture. It consists of a semi-circular support having a hinged cap, provided with a hinged bolt with a spring and knurled nut, for clamping the telescope.

vii. *The Mark I brow pad, arm and bracket* are identical with those on the mounting M.G., No. 6, Mark I.

viii. *The gun protecting jacket* is similar to that for the ·303-in. gun on mounting M.G., No. 8, Mark I, but is shorter in length. Jackets of early manufacture, known as Mark I were 8 mm. in thickness (approx.). No more of these will

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be made ; for identification purposes a one-inch white band will be painted around the Mark I jackets near the flange. The Mark II pattern differs from the Mark I only in that it is approximately 4 mm. thicker, and in the pattern of the securing screws.

ix. *Plates, filling-in—Two upper and one lower.*

(*a*) The upper left plate is fitted between the gun and telescope apertures with the upper edge arranged to fit close to the elevating block ; it is secured to the cradle by two of the bracket shield screws referred to below.

(*b*) The upper right plate is fitted between the gun aperture, the inner edge of the right side and the top of the elevating block ; the upper and right edges are adjusted to fit close to the latter. It is secured by three screws, two of which are bracket shield screws referred to below.

(*c*) The lower plate is fitted between the left side of the cradle and the adjacent side of the elevating block. It is bent near the right edge and has two strengthening webs extending from this portion to the opposite side. The plate, which is secured to the cradle by a screw through a projection at the top, is also secured to the side of the left bracket of the No. 5 carrier, belt box, by a screw near the bottom right-hand corner.

x. *The bracket shield* is semi-circular in section and has a flange at each end. The flange at the front end is drilled for attachment to the cradle by four screws which also serve to secure the two upper filling-in plates referred to above. The flange at the rear end is drilled for attachment of the shield.

xi. *The shield* is a square-shaped steel plate with openings for the gun and telescope, the former being extended to the right side to permit assembly. The inside face is lined with asbestos, and steel angle plates are riveted around and near the edge. The top and bottom are set at suitable angles to allow the necessary clearance in traversing. The shield is secured to the shield bracket by four bolts and to the belt box carrier brackets by four screws.

xii. *The strips, anti-splash.*

(*a*) One is fitted along the edge of the upper anti-splash plate and secured to the latter by five screws. It consists of a sheet steel strip bent lengthwise at an angle of 30 degrees and lined with asbestos.

(*b*) One is fitted to the upper traversing bearing plate of the elevating block and secured by two compound studs which replace existing countersunk-headed screws. A portion of the strip which lies over the gun aperture is bent and lined with

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asbestos similar to (*a*), and the other is a steel strip bent near each edge at an angle of 90 degrees and lined with asbestos. A portion at the top and bottom is reduced in width, bent at right angles and slotted to permit assembly under one of the compound studs on the upper, and a similar stud on the lower, traversing bearing plates.

(*c*) One consists of a mild steel angle strip which is secured to the underside of the cradle by two screws.

11. MOUNTINGS, M.G. NO. 7, MARK II

(For one ·303-in. M.G. Marks VI or IV in Marks I and II Lanchester and six-wheeled Crossley armoured cars)

1. Consisting of cradle; left and right elevating bearing brackets; two inner and three outer anti-splash plates; shield with bracket; one Mark II lower, and two upper filling-in plates; four anti-splash strips; elevating block; Mark II mantlet; shutter; Mark II brow pad, arm and bracket; Mark II (or Mark I) gun protecting jacket and spanner.

2. The No. 7, Mark II differs from the No. 7, Mark I in the following respects:—

i. *The cradle* is constructed in one piece instead of two. The telescope holder is integral with the cradle and provision is made for the assembly of a shutter for closing the telescope aperture. The hinged cap for clamping the telescope has a stop to limit the amount of its opening and the clamping bolt has a wing nut instead of knurled.

ii. *The mantlet.*—The bearing for the front end of the telescope is omitted.

iii. *The Mark II brow pad, arm and bracket.*—The upturned portion of the arm is shorter and the stem has a series of recesses for the engagement of the clamping screw. The arm is supported by an "L" shaped bracket fitted to the cradle instead of by a bracket on the telescope.

iv. *The shutter* is similar to that on the No. 8 mounting.

v. *The plate, filling-in, lower,* is similar to that of the Mark I pattern, but differs in the following particulars—

It has a "T" slot to clear the shutter operating lever; the webs are omitted; the right side is drilled for attachment under the left bracket of the No. 6 belt box carrier by two bolts which secure the latter.

vi. *The strip packing.*—A steel packing strip is fitted under the right bracket of the No. 6 belt box carrier to compensate for the added thickness of the lower filling-in plate under the left bracket.

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12. MOUNTINGS, M.G. NO. 8, MARK I

(For one ·303-in. M.G. Mark VI or IV in medium tanks Mark III, light tanks Marks II, IIA, IIB, and III and six-wheeled Crossley armoured cars)

1. Consisting of cradle; cradle frame; four fixed and two hinged anti-splash plates; mantlet; 2 mantlet end covers; brake; shutter; mounting lock; Mark II brow pad; Mark I brow pad, arms and bracket; Mark II (or Mark I) gun protecting jacket and spanner.

2. Detail.—This is of the free elevation type and arranged for a maximum of 37 degrees elevation and 13 degrees depression; traverse is obtained by movement of the turret.

i. *The cradle supporting frame* is bolted to the turret, and consists of two side elevating bearing brackets connected by an upper and lower transom; a spanner is housed in a clip and hook on the right elevating bearing bracket, and is secured by a chain and screwed eye.

ii. *The anti-splash plates.*—Long and short fixed plates of manganese bronze are fitted to the upper transom, the short one on the left and the long one on the right; between the two is a hinged plate closed by a spring. When the mounting is depressed the telescope engages the hinged plate and causes it to open. On the lower transom are two short plates and a hinged plate similar to that on the upper transom; this hinged plate is engaged and opened by the underside of the cradle to permit of the full 37 degrees elevation.

iii. *The cradle* is of manganese bronze and has trunnions which fit the bearing brackets of the cradle supporting frame, and openings for the gun and telescope. At the rear end of the telescope aperture is a flanged portion with a cap and spring bolt for clamping the telescope. Similar provision to that in the cradle of the No. 6 and No. 7 mountings is made for securing the gun.

iv. *The mantlet* is similar to that on the No. 6 mounting in its main features, but is arranged for one gun instead of two.

v. *The gun protecting jacket* is similar to that of the ·303-in. gun jacket on the No. 6 mounting, but differs in minor details. Jackets of early manufacture, known as Mark I, were 8 mm. thick (approx.). No more of these will be made; for identification purposes a one-inch white band will be painted around the Mark I jackets near the flanges. The Mark II pattern differs from the Mark I only in that it is approximately 4 mm. thicker, and in the pattern of the securing screws.

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vi. *The right and left mantlet covers*, of bullet-proof steel, are secured to the outside of the turret to cover the open side of the mantlet where it projects through the turret.

vii. *The brake* is fitted to the left bearing bracket and consists of two shoes, with ferodo lining, which fix round the cradle trunnion where it projects through the bearing bracket; a bolt with fluted adjusting nut is provided to adjust the tension.

viii. *The Mark II brow pad, Mark I arm and bracket.*—A bracket for the brow pad is fixed to the flanged portion on the cradle. The rear end is cylindrical, and has a side projection, with a square hole through it, fitted with a clamping screw for retaining the brow pad arm which is bent at right-angles and carries the brow pad. The brow pad consists of a curved steel plate having a sorbo rubber pad secured to it; the plate, which has a boss on the convex side, is loosely fitted to a stud and held by a spring housed in the boss. A projection on the face of the boss engages slots in the stud flanges and allows the pad to be held either horizontally or at a slight angle. The stud can be adjusted in a slot in the brow pad arm, and is secured by a nut and washer.

ix. *The shutter* is arranged to slide in a slot in the gun cradle and covers the telescope aperture. It consists of metal plate with a link at its bottom end connected to an operating lever pivoted to the left side of the cradle. The plate is secured by a spring plunger.

x. *The mounting lock* is fitted to the upper transom; it consists of a spring plunger housed in a bracket and loosely fitted to the centre of a lever, the front end of which is secured to a pivot on the transom. The plunger, which projects through the upper transom and engages a slot in the mantlet, locks the mounting at 10 degrees elevation; it is disengaged and held in a position clear of the mantlet by lifting the lever, moving it to the right and resting it on the bracket.

NOTE.—Pads, brow, Mark III (new pattern) will be issued for replacement purposes only. (For M.G. mountings, No. 6 to 10, all Marks.)

It consists of a curved steel plate with sponge-rubber pad secured to the concave side, and a bracket, with a spherical boss, with a loose retaining socket. This forms a partial ball and socket joint enabling the pad to be set at a maximum angle of 5 degrees right or left, or 29 degrees up or down. The retaining socket fits the slot in the brow pad arm of the mounting, and a spring washer and wing nut clamps the pad to the arms.

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13. MOUNT, FIELD, VICKERS, ·303-IN. M.G. MARK I

The field mount is for use in conjunction with the No. 4 M.G. shoulder piece to enable the ·303-in. M.G. Marks VI or IV to be used outside the vehicle in case of emergency.

It consists of a gun band secured to a saddle to which two telescopic legs are jointed.

The gun band is lined with leather; at its free end is assembled a "T" shaped nut for the clamping screw with lever.

The legs, which are of tubular steel, are telescopic and can be clamped at the desired height by clamping screws. Each leg has a spike and hinged curved shoe. When the spikes are embedded in the ground the shoes, owing to their curved shape, automatically splay out and prevent the legs from sinking into the ground. When not in use, the legs can be hinged backward under the gun and are retained in position by a spring clip.

The mount is assembled to the gun by passing the gun band over the barrel casing from the front, and is clamped in position by the quick release fastening. When clamped in position on the casing it must be sufficiently clear of the ejection tube to permit of the free ejection of the empty cartridge cases. The clamping lever is adjusted to give the correct tension, after first removing the keeper pin from the screw nut, by turning the clamping screw further into, or out of, the nut as required. When the required tension is obtained the keeper pin must be re-assembled.

14. SHOULDER PIECE, M.G. NO. 4

(For the ·303-in. M.G. Marks VI or IV)

This is for use in conjunction with the field mount on ·303-in. M.G. Marks VI or IV. It consists of an aluminium body shaped to fit the shoulder and is provided with flanges and a spring catch for engagement with the rear cross-piece of the gun. A telescopic leg fitted to the bottom of the body consists of an outer and inner tube. The inner tube is fitted with a cup base and can be locked at any desired height by a bolt and wing nut.

15. COUNTERWEIGHT, M.G. NO. 1

(For use with the ·303-in. M.G. Mark I in No. 3 Marks II, IIA, III and IV and No. 4 Mark I M.G. mountings)

Consisting of lead weights, two securing plates and four bolts, each with nut and keep pin.

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Pamphlet No. 5

·5-IN. VICKERS MACHINE GUN, MARK V

1937

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TANK TRAINING, VOL. II, PART III

PAMPHLET NO. 5

·5-INCH VICKERS MACHINE GUN, MARK V 1937.

1. GENERAL DESCRIPTION

1. The ·5-in. M.G., Mark V, is constructed on similar lines to the ·303-in. M.G., Mk. VI, and is interchangeable with ·303-in. M.Gs. in the Nos. 8, 9 or 10 mountings.

The principal differences, apart from size, are as follows :—

i. **Barrel casing.**

(*a*) *End cap.*—Is fitted with a gunmetal packing gland. The gland is locked in position on the end cap by a locking piece, which is attached to the cap by a keeper screw and engages the adjacent serrations in the flange.

(*b*) *Steam tube, No. 2 with valve.*—The arrangement of the steam tube assembly is similar to that of the ·303-in. M.G., Mk. VI. The tube is assembled from the front end of the cap. The head of the tube, which is larger and screwed internally for the valve, is fitted eccentrically to the tube.

The valve is of brass ; the front portion, threaded for assembly into the head of the steam tube, has an annular groove near the rear for packing, and three small holes in the front end for the escape of steam ; the rear portion is screwed into the front and has a number of holes drilled into it to form a baffle. Inside the valve a non-corrodible steel ball is pressed by a plunger and spring on to the end of the baffle which forms the valve. The valve, which allows steam to escape before the pressure in the barrel casing exceeds 10 lb. a sq. in. is designed to prevent loss of water.

(*c*) *Trunnion block.*—A steel plate is riveted to the rear face of the cylindrical portion of the trunnion block for the engagement of the front cover catch.

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ii. **Breech casing.**

(*a*) *Right outside plate.*

1. Adjacent to the feed block gap is riveted a bracket which forms the housing for the layshaft and trip gear.

   The trip gear cap is cylindrical in form, and is secured to the head of the layshaft bracket on the bayonet joint principle. When in the engaged position, it is secured by a screw, and a line marked on the cap matches with the line on the layshaft bracket.

   The cap carries the trip gear regulating lever for single shot or automatic fire. The letters " R " (Repetition) and " A " (Automatic) are marked on the cap to indicate the required setting.

   The trigger bar lever has a single arm and is assembled below the housing of the trip gear. It acts on a lug on the trigger bar and is operated by the trip gear plunger and layshaft spring.

   NOTE.—The layshaft spring retains the trigger bar lever in the forward position when the trigger guard carrier has been removed.

2. *Safety stop, plunger and spring.*—Are housed in a bracket attached to the right outside plate. A bayonet jointed cap secures the plunger and spring in the bracket; the cap is retained by two split keeper pins.

3. *Check lever bracket.*—The axis stud is longer and is drilled near its outer end to take a split keeper pin for a collar which is employed in lieu of a keeper pin for retaining the check lever.

(*b*) *Left outside plate.*

1. A stud is riveted at the front end of the plate for the assembly of the bracket of the fuzee spring.

2. *The fuzee spring assembly*, which is attached to the left plate, consists of :—

   (i) *Bracket.*—Hooks on to a stud riveted to the left plate.

   (ii) *Adjusting screw and vice pin.*—The adjusting screw is threaded and screws into the fuzee spring tube nut.

   (iii) *Fuzee spring tube nut.*—Is threaded to receive the adjusting screw and on the outside for screwing into the fuzee spring tube. A slot is provided in the front face of the nut for the use of a tool for

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stripping purposes. The nut is drilled to admit a split pin which prevents the nut unscrewing when assembled to the tube.

(iv) *Fuzee spring tube.*—Is threaded internally at the front end to take the nut, and a hole is drilled to receive the split keeper pin which passes through the nut. About 2-in. from the front four holes are drilled for the use of a tool for stripping purposes. At the rear end of the tube, on the inside, is the rear seating of the fuzee spring.

(v) *Fuzee spring.*—Is of the compression type.

(vi) *Fuzee spring rod.*—Is tubular in section ; riveted into the rear end of the rod is a hook for connecting to the fuzee chain. The head of the rod is flanged and acts as a retainer for the collar, the latter forming the front seating of the fuzee spring.

(vii) *Fuzee and chain.*—The links are larger and the chain is lengthened.

The fuzee spring can be adjusted by rotating the vice pin on the adjusting screw or by rotating the fuzee spring tube.

NOTE.—The outside plates are made of higher tensile steel and are thicker at the rear to give strength at the guide slots for the side plates.

(*c*) *Resistance piece.*—Is formed in one unit with the right and left slides. A " T " slot is provided on the left slide to receive the adaptor of the fuzee guard. The roller is fitted to the right slide.

(*d*) *Rear cross-piece.*—Has wider grooves to suit the thicker outside plates.

(*e*) *Bottom plate.*—A bracket is riveted near the rear end to engage the catch of the trigger guard carrier.

(*f*) *Mounting base.*—Is identical in size with that of the ·303-in. M.G., Mk. VI, but is designed with a short tube, coned internally to form a seating for the front of the ejection tube. A rectangular shaped hole in the mounting base, for use in the manufacture of the gun, is closed by a plate and secured by two screws.

(*g*) *Front cover.*—A bracket riveted to the underside at the front houses the front cover catch, the latter engaging the plate on the trunnion block.

Two lugs are formed near the centre on the underside of the cover to house a flat spring which is arranged to act as an extractor stop.

(*h*) *Rear cover.*—Clearances are made at the front end on

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the right side, for the lug on the trigger bar lever and for the head of the layshaft.

The trigger bar is assembled to the underside of the cover; it has a projecting lug at the front end for engagement of the trigger bar lever, the lug being recessed to take the free end of the trigger bar spring. A split keeper pin is provided at the front end of the cover for retaining the trigger bar.

The rear cover catch is housed in grooves arranged on top of the rear cover and is retained by a pin which is inserted from the underside; the pin is held in position by the trigger bar.

(*i*) *Trigger guard carrier.*—Engages in the bottom plate of the breech casing; it is drilled at the front for the axis pin connecting the ejection tube to the carrier. A bracket is fitted on the right side which carries the layshaft lever. A hole at the rear end carries the spindle of the loading catch.

The following parts are assembled to the carrier :—

1. *Ejection tube.*—The head is drilled for the axis pin connecting the tube to the carrier, and for the plunger of the cartridge check; the latter forms the cartridge check and is actuated by a spring; both are retained in the head of the tube by a keeper pin.
2. *Layshaft lever.*—Is assembled to the bracket on the right of the carrier, where it is retained by a keeper screw.
3. *Trigger guard carrier catch.*—Is similar to that of the ·303-in. M.G., Mk. VI.
4. *Loading catch.*—Is similar to that of the ·303-in. M.G., Mk. VI.
5. *Trigger guard.*—Is of the central action type and assembles to the bottom of the trigger guard carrier, where it is retained by two screws.

   The sliding bar of the finger trigger is recessed at the front end for engagement with the layshaft lever. The trigger spring is supported by a guide rod. Anti-friction rollers are provided, one fitted into the forked end of the rod and the other to the front end of the sliding bar.

iii. **Recoiling portions.**

(*a*) *Barrel.*—Recesses are cut in the upper and lower surfaces of the trunnion block for the engagement of the bottom lever of the right and left-hand feed blocks.

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(*b*) *Side plates, right and left.*—Dust cover extensions are omitted. No prolongation is provided on the left plate.

(*c*) *Crank.*—Differs in profile, and has a connecting rod spring riveted to the inside of the left jaw; the spring has a nib formed on its outer end which engages a notch in the side of the connecting rod.

(*d*) *Connecting rod.*—Is extended beyond the bayonet joint to give greater support to the lock.

(*e*) *Lock.*—Is similar to that of the ·303-in. M.G., Mk. VI.

(*f*) *Crank handle.*—Is similar to that of the ·303-in. M.G., Mk. VI.

(*g*) *Feed block, left or right hand.*—Has a bullet guide spring fitted at the front and a cartridge guide spring at the rear of the feed block on the inside, for positioning the cartridge in readiness to be gripped by the extractor.

2. General particulars.

Weight of gun	63 lb. (approx.)
Weight of gun with water	71¾ lb. ,,
Weight of shoulder piece, No. 5	6½ lb. ,,
Weight of shoulder piece, No. 6	1¾ lb. ,,
Weight of crank handle guard, Mk. II	3 lb. ,,
Weight of fuzee guard	½ lb. ,,
Barrel :—	
Weight	7½ lb. (approx.)
Length	31·1 in.
Calibre	·5 in.
Type of rifling	Concentric
Number of grooves	7.
Direction of twist	Left hand.
Pitch	Uniform, 1 in 15.
Width of lands	·08 in.
Depth of grooves	·006 to ·009 in.
Rate of fire	500 to 600 rounds a minute.
General—	
Muzzle velocity	2,550 ft. a sec.
How operated	1. Recoil. 2. Fuzee spring.
Ammunition	100 rounds carried in a webbing belt.

3. General introduction to the weapon.

Is similar to the ·303-in. M.G., Mk. VI, with particular attention to the points in para. 2 above.

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2. STRIPPING

1. General remarks.—As for the ·303-in. M.G., Mk. VI, Pamphlet No. 2.

2. Removing and replacing the gun in the mounting.—Is similar to that of the ·303-in. M.G., Mk. VI.

3. Normal Stripping—The gun, having been removed from the mounting, will be stripped in the following sequence :—

i. *Lock.*—Is similar to that of the ·303-in. M.G., Mk. VI.

ii. *Trigger guard carrier.*—Press the thumb-piece of the trigger guard carrier catch forward and lower the trigger guard carrier, withdraw the latter to the rear, taking care not to damage the ejection tube.

NOTE.—In removing or replacing the trigger guard carrier, the finger must be clear of the trigger.

iii. *Feed block.*—Is similar to that of the ·303-in. M.G., Mk. VI.

iv. *Fuzee spring assembly.*

(*a*) *To remove.*—Open the rear cover and lock the connecting rod to the crank by means of the connecting rod spring. Pull the crank handle back as far as it will go, and insert the small end of the " T " fixing pin or No. 5 punch into one of the holes near the front of the fuzee spring tube, thus holding the spring under compression ; ease the crank handle on to the check lever, disengage the fuzee chain from the hook on the rod, disengage the bracket from the stud on the left side plate.

(*b*) *To assemble.*—Secure the connecting rod as in (*a*) ; attach the bracket to the stud and connect the fuzee chain to the rod ; pull back the crank handle and remove the " T " fixing pin or No. 5 punch.

vi. *Fuzee.*—Is similar to that of the ·303-in. M.G., Mk. VI.

vii. *Recoiling portions.*—Unscrew and remove the " T " fixing pin ; lower the rear cross-piece ; remove the resistance piece ; remove the fuzee guard if fitted ; draw out the recoiling portions ; disconnect the side plates from the barrel.

The gun will be assembled in the reverse order. Particular attention should be paid to the following notes :—

1. On withdrawing the recoiling portions care must be taken not to damage the connecting rod spring on the hinged-down rear cross-piece.

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2. In replacing the barrel, the recess in the trunnion block of the barrel which has previously been in engagement with the stud on the bottom lever of the feed block will be uppermost.
3. When the trigger guard carrier has been removed, ensure that the trigger bar lever is forward before closing the rear cover.

NOTE.—This is unnecessary if the layshaft spring is fitted. Guns may be found where the spring is not fitted.

4. Stripping the lock.—Is similar to that of the ·303-in. M.G., Mk. VI, with the following notes :—

i. In replacing the firing pin, it will be inserted into the lock casing until the bent of the firing pin engages with the bent of the sear.

ii. To ensure correct assembly of the lock spring, use a No. 5 punch to force it down into engagement.

5. Stripping the feed block, left or right hand.

i. Remove the split keeper pin of the top and bottom levers ; separate the top and bottom levers ; take out the slide with feed pawl.

Drive out the axis pin of the feed pawls : remove the pawl and spring.

Remove the screwed axis pins of the retaining pawls ; lift out the pawls and spring.

Assemble in the reverse order, with special attention to the points noted for the ·303-in. M.G., Mk. VI.

ii. *Bullet guide spring.*—Insert a No. 3 punch in the looped portion of the spring by the mouth of the feed block, and pull out the spring.

6. Stripping other parts.

(Those marked with an asterisk will be stripped by a qualified armourer only.)

i. *By the gunner.*

(*a*) *Gland.*—Slacken the keeper screw of the locking piece ; lift up the locking piece, so disengaging the teeth from the serrations on the gland. Secure the locking piece in this position and unscrew the gland.

(*b*) *Roller.*—Is similar to that of the ·303-in. M.G., Mk. VI.

(*c*) *Gib and spring.*—Is similar to that of the ·303-in. M.G., Mk. VI.

Assemble in the reverse order.

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ii. *By a qualified armourer only.*

(*a*) *Steam tube.**—Place the gun on end so that it stands on the rear crosspiece. Remove the valve; remove the keeper screw positioning steam tube; unscrew and remove the steam tube.

(*b*) *Front cover catch.**—Remove the split pin and pin retaining front cover catch; remove the front cover catch and spring.

(*c*) *Front cover.**—Remove the split pin; unscrew the check nut; remove the joint pin.

(*d*) *Trigger bar and spring.**—Remove the split pin retaining trigger bar; remove the trigger bar spring; disengage the trigger bar from the interrupted flanges of the trigger bar guides and remove.

(*e*) *Rear cover catch.**—From the top of the rear cover, force out the pin retaining rear cover catch; remove the catch and spring.

(*f*) *Rear cover.**—Remove the split pins, collars, and hinge pins; remove the rear cover.

(*g*) *Layshaft and trip gear.**—Remove the screw retaining layshaft; remove the screw retaining trip gear cap; lift up the regulating lever until clear of the stop on the cap and rotate until parallel with the breech casing, then lift out. Open the rear cover, rotate the trip gear cap clockwise and lift off. Remove the layshaft spring. Remove the layshaft complete from the housing; remove the trigger bar lever.

To remove the trip gear plunger and spring, drive out the retaining pin of the trip gear plunger; remove the plunger and spring.

(*h*) *Safety stop plunger and spring.**—Remove the two split pins from the cap of the safety stop plunger; press in the cap and rotate until the lugs on the inside of the cap are clear of the recess in the housing and withdraw; remove the spring and plunger.

(*i*) *Ckeck lever.**—Remove the split pin, collar and check lever.

(*j*) *Crank handle.**—Is similar to that of the ·303-in. M.G., Mk. VI.

(*k*) *Fuzee spring assembly.**

1. Remove the adjusting screw and bracket; remove the "T" fixing pin or No. 5 punch from the fuzee spring tube, thus releasing the tension from the fuzee spring; remove the split pin

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from the fuzee spring tube nut; unscrew the nut; remove the rod and spring.

2. *To assemble.*—Replace the fuzee spring and rod; force in the rod until the head is clear of the holes in the tube and replace the " T " fixing pin or No. 5 punch; replace the nut, keeper pin and adjusting screw with bracket.

(*l*) *Trigger guard carrier assembly.**

1. *Ejection tube.*—Remove the pin, split, bush axis, trigger guard carrier and bush; remove the ejection tube. Remove the pin retaining ejection tube plunger and spring; remove the plunger and spring.
2. *Trigger guard.*—Remove the two screws fixing the trigger guard to the carrier; remove the trigger guard; drive out the axis pin of the rear roller of the finger trigger; remove the finger trigger from the guard; remove the trigger spring, guide rod and rear roller; drive out the axis pin of the front roller.

   Remove the screw retaining safety catch; remove the catch, plunger and spring.

   NOTE.—Care must be exercised, in replacing the trigger guard to the trigger guard carrier, to ensure that the layshaft lever is in correct engagement with the recess in the sliding bar of the finger trigger.
3. *Layshaft lever.*—Remove the screw retaining layshaft; remove the layshaft lever.
4. *Catch, trigger guard carrier.*—Press the trigger guard catch forward until the heads of the two screws retaining the thumbpiece of the catch can be removed; the heads of the screws are exposed in the two holes on the left side of the trigger guard carrier. Remove the two screws and thumbpiece; remove the catch. Force out the axis pin retaining trigger guard carrier catch spring guide, and remove the guide and spring.
5. *Loading catch.*—Remove the screw from the loading catch lever; remove the lever; remove the loading catch and spring. Remove the screw retaining loading catch sleeve, remove the sleeve.

(*m*) *Extractor detent, plunger and spring.** (Mk. III extractor).—Using a No. 3 punch, depress the plunger clear of the detent cover (situated at the

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bottom of the extractor on the rear face) ; remove the detent cover ; remove the plunger and projecting detent.

(*n*) *Sear spring.**—Is similar to that of the ·303-in. M.G., Mk. VI.

7. Method of instruction.—Is similar to that of the ·303-in. M.G., Mk. VI.

3. THE MECHANISM

1. General remarks.—As for the ·303-in. M.G., Mk. VI. Pamphlet No. 2.

2. The mechanism.

i. *To load.*—Is similar to that of the ·303-in. M.G., Mk. VI.

ii. *To fire.*—Is similar to that of the ·303-in. M.G., Mk. VI.

iii. *To unload.*—Is similar to that of the ·303-in. M.G., Mk. VI.

iv. *Action on recoil.*—Supposing the gun to have just fired the first cartridge. The extractor will be gripping the second round in the feed block, and the empty case of the round which has just been fired in the chamber.

The explosion will cause the recoiling portions to move backwards a little over 1 in., thereby compressing the fuzee spring.

Method of instruction.

To prepare the gun.—Remove the fuzee spring, load the gun with an empty case in the chamber and a dummy round in the feed block. Fire the lock. Remove the resistance piece. Refix the rear crosspiece. Open the rear cover.

Demonstration.—Push back the recoiling portions from the front.

Explanation.—(1) Explosion.
(2) Recoiling portions driven backwards.
(3) Fuzee spring compressed.

Interrogation.

v. *First action in the feed block* (right and left hand feed blocks).—As the recoiling portions travel backwards, the recess in the barrel block carries with it the stud on the bottom lever of the feed block. The bottom lever, acting on the top lever, causes the slide and feed pawls to move to the right (left if left-hand feed block is fitted), enabling the feed pawls to engage

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behind the cartridge already held in position by the retaining pawls.

Method of instruction.

To prepare the gun.—As for " Action on recoil," except that for " rear cover " substitute " front cover."

Demonstration.—As for " Action on recoil."

Explanation.—(1) Recess in barrel block.
(2) Stud on bottom lever.
(3) Bottom lever acting on top lever.
(4) Movement of slide.
(5) Feed pawls engaging behind cartridge held by retaining pawls.

Interrogation.

vi. *Backward rotation of the crank.*—The backward movement of the recoiling portions causes the tail of the crank handle to roll on the roller, thereby rotating the crank. The rotation of the crank withdraws the lock and causes the fuzee to wind the fuzee chain, thus further compressing the fuzee spring.

Owing to the momentum of the lock, connecting rod, crank and crank handle, the crank handle continues to roll against the roller. This rolling action of the crank handle on the roller, assisted by the fuzee spring, forces the whole of the recoiling portions forward with the exception of the lock, which continues its backward movement until the extractor is free to drop before joining in the forward movement.

Method of instruction.

To prepare the gun.—Remove the fuzee spring, load the gun with an empty case in the chamber and a dummy round in the feed block. Open the rear cover. (The lock is left cocked to simplify the demonstration.)

Demonstration.—Backward rotation of the crank demonstrated by pushing back the recoiling portions.

Explanation.—(1) Recoiling portions moving back; tail of crank handle bearing against the roller.
(2) Rotation of the crank; lock withdrawn; fuzee chain wound round fuzee.
(3) Momentum of lock, etc.
(4) Barrel and side plates moving forward.
(5) Lock continuing to the rear.

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(6) Barrel and side plates home; lock free to move forward.

Interrogation.

vii. *Second action in the feed block* (right and left-hand feed blocks).—As the recoiling portions travel forward, the recess in the barrel block carries with it the stud on the bottom lever of the feed block. The bottom lever, acting on the top lever, causes the slide to move to the left, (right if left-hand feed block is fitted). The feed pawl, being engaged behind the third cartridge in the belt, carries it to the left (right if left-hand feed block is fitted), the bullet of the cartridge compresses the bullet guide spring and the rear of the cartridge case compresses the cartridge retaining spring. As the base of the cartridge enters the opening in the feed block, the nib on the cartridge retaining spring engages in the groove in the case. The action of the bullet guide spring and cartridge retaining spring holds the cartridge firmly in position, in readiness to be gripped by the extractor.

The cartridge is prevented from going too far to the left (right if left-hand feed block is fitted) by the cartridge and bullet stops.

The belt, as it moves through the feed block, slides between the retaining pawls, which are forced upwards as the cartridge bears against them; when the cartridge is clear of the pawls, the retaining pawl spring re-asserts itself, causing the pawls to engage behind the fourth cartridge in the belt, thus holding the belt in position and preventing it from sliding back after the third cartridge has been withdrawn from the feed block by the extractor.

Method of instruction.

To prepare the gun.—Remove the fuzee spring, load the gun with an empty case in the chamber and a dummy cartridge in the feed block. Push back the recoiling portions and open the front cover.

Demonstration.—Recoiling portions forced forward; slide moving to the left (or right).

Explanation.—(1) Recess in barrel block.
(2) Stud on bottom lever.
(3) Bottom lever acting on top lever.
(4) Movement of slide.
(5) Action of feed pawls.

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(6) Bullet guide spring.
(7) Cartridge retaining spring.
(8) Cartridge and bullet stops.

Interrogation.

viii. *Backward movement of the lock.*—As the lock moves backwards, the extractor withdraws the live round from the feed block and the empty case from the chamber. The horns of the extractor move along the surface of the cams until the cartridge is clear of the belt; the right horn of the extractor, coming into contact with the spring loaded extractor safety stop plunger, forces the latter into its housing, thus allowing the horn to pass by. Immediately the right horn is clear of the plunger, the latter, owing to the action of its spring, is forced out. When the right horn is clear of the safety stop, the horns of the extractor, bearing against the curved ramps on the underside of the rear cover, cause the extractor to drop, thus placing the round from the feed block in line with the chamber and the empty case in line with the ejection tube.

The round from the feed block is prevented from slipping down the face of the extractor by the bottom projection of the gib, and the empty case is held on the extractor by the projecting detent. If for any reason the lock does not come far enough back to allow the extractor to drop, the extractor safety stop prevents the lock from going forward and the horns of the extractor from riding forward on the surface of the solid cams. This prevents the bullet of the cartridge held by the extractor from piercing the cap of the round brought into position in the feed block, and so causing a feed block explosion.

Method of instruction.

To prepare the gun.—Remove the fuzee spring, load the gun with an empty case in the chamber and a dummy round in the feed block. Fire the lock and open the rear cover.

Demonstration.—Push back the recoiling portions.

Explanation.—(1) Withdrawal of cartridge from feed block and empty case from chamber.
(2) Horns of extractors riding along solid cams.
(3) Depression of safety stop by right horn of extractor.

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(4) Extractor forced down by ramps.
(5) Cartridge in line with chamber, empty case in line with ejection tube.
(6) Cartridge and empty case held on extractor.

Interrogation.

ix. *Cocking action of the lock.*—The rotation of the crank gives an upward motion to the connecting rod and side lever head; the latter, bearing on the tail of the tumbler, rotates the tumbler on its axis; the head of the tumbler, being engaged in the recess of the firing pin, draws the firing pin to the rear. The long arm of the lock spring is bearing against the projection on the firing pin, and the short arm against the nose of the trigger; consequently the withdrawal of the firing pin compresses the lock spring. As the tumbler rotates, the short arm of the lock spring forces the nose of the trigger over the bent of the tumbler and the continued rotation of the tumbler draws back the firing pin still further to the rear until the bent of the sear (which is actuated by the sear spring) is forced into engagement with the bent of the firing pin, thus holding the firing pin to the rear. The lock is now cocked.

Method of instruction.

To prepare the gun.—As for "Backward movement of the lock."

Demonstration.—(Using gun and cut lock). Push the recoiling portions to the rear; continue the demonstration with cut lock.

Explanation.—(Using gun and cut lock and/or diagrams).
(1) Upward movement of side lever head.
(2) Rotation of tumbler.
(3) Firing pin withdrawn.
(4) Compression of lock spring.
(5) Nose of trigger and bent of tumbler.
(6) Bents of sear and firing pin.

Interrogation.

x. *Action of the fuzee spring.*—When the force of explosion is expended, the fuzee spring unwinds the fuzee chain from the fuzee. This action gives a forward rotary movement to the crank, thus causing the connecting rod and side lever head to move forward

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and downwards, so causing the lock to move forward.

Method of instruction.

To prepare the gun.—Load the gun with an empty case in the chamber and a dummy cartridge in the feed block ; pull the crank handle to the rear ; pull the belt and open the rear cover.

Demonstration.—Allow the crank handle to go slowly forward on to the check lever.

Explanation.

(1) Connection of fuzee spring and chain to crank.
(2) Forward and downward movement of connecting rod and side lever head.
(3) Forward movement of lock.

Interrogation.

xi. *Forward movement of lock.*—As the lock travels forward, the extractor places the live round in the chamber and the empty case in the ejection tube. The side levers, acting on the extractor levers, cause the extractor to rise. The projecting detent rides over the base of the fired cartridge in the ejection tube ; the empty case is prevented from falling back into the breech casing by the cartridge check. The bottom projection of the gib slides over the base of the cartridge in the chamber and the top projection of the gib slides over the base of the cartridge in the feed block.

When the extractor reaches its highest position, the firing pin hole is brought opposite the cap of the cartridge in the chamber and the side plate springs engage in grooves each side of the extractor, near the bottom. The springs prevent the horns of the extractor from falling and fouling the front end of the solid cams in the breech casing, at the beginning of the backward movement when the face of the extractor is clear.

The further movement of the connecting rod and side lever head completes the locking of the breech (*see* Pamphlet No. 2, 1936, Sec. 4, xvii).

During this movement the steps on the side levers ride over and engage with the bents on the extractor levers.

Method of instruction.

To prepare the gun.—Load the gun with an empty case in the chamber and a dummy cartridge in the feed

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block ; pull the crank handle to the rear ; pull the belt and open the rear cover.

Demonstration.—(1) Crank handle eased forward on to check lever.

(2) Cut lock.

Explanation.—(Using gun, cut lock or/and diagrams.)

(1) Cartridge in line with chamber, empty case in line with ejection tube.
(2) Side levers acting on extractor levers.
(3) Extractor rising.
(4) Projecting detent.
(5) Bottom and top projection of gib.
(6) Firing pin hole opposite cap.
(7) Side plate springs.
(8) Further downward movement of connecting rod and side lever head.
(9) Breech closed.

Interrogation.

xii. *Firing action—First shot.*—For the first shot, as the side lever head comes slightly below the horizontal, it depresses the tail of the sear, thereby disengaging the bent of the sear from the bent of the firing pin, so causing the latter to move slightly forward until the bent of the tumbler engages with the nose of the trigger.

With the regulating lever of the trip gear cap set at " A," the cut-away portion of the stem of the regulating lever is so positioned that, when the layshaft is rotated, the fixed lug on the trip gear plunger is permitted to rotate freely.

The trigger bar lever pivoted below the head of the layshaft is retained in position by the lug at its forward end engaging between the trip gear plunger and the layshaft spring.

When the safety catch is disengaged and the trigger is pulled back, the layshaft lever, being engaged with the sliding bar of the finger trigger, is rotated ; the spindle of the layshaft lever, being engaged with the layshaft, causes the latter and the trigger bar lever to rotate thus causing the trigger bar to move backwards ; the trigger bar, being in contact with the tail of the gun lock trigger, rotates the latter on its axis, so disengaging the nose of the trigger from the bent of the tumbler. (During this action the layshaft spring is compressed.)

The long arm of the lock spring then carries the

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firing pin forward on to the cap and explodes the charge.

Method of instruction.

To prepare the gun.—Load. Open the rear cover. Remove the regulating lever, trip gear cap, and trigger bar. Explanation of the component parts of the trip gear assembly. Engage the trigger bar with the tail of the gun lock trigger and the trigger bar lever.

Demonstration.—(1) Cut lock.
(2) Firing mechanism.

Explanation.—(Using skeleton lock.)
(1) Bents of sear and firing pin.
(2) Lock spring forcing firing pin forward.
(3) Nose of trigger and bent of tumbler.

(Using gun—Remove the trigger guard carrier to explain the action of the trigger mechanism.)
(1) Safety catch depressed and trigger pulled back.
(2) Rotation of layshaft lever.
(3) Action of trigger bar lever.
(4) Tail of trigger drawn back by trigger bar.

(Using skeleton lock.)
(1) Nose of trigger disengaged from bent of tumbler.
(2) Action of long arm of lock spring.
(3) Firing pin exploding charge.

Interrogation.

xiii. *Firing Action—Subsequent shots.*—By maintaining pressure on the finger trigger, the trigger bar lever is held back, so that each time the lock travels forward the trigger bar holds back the tail of the gun lock trigger before the lock is quite home. By this means the nose of the trigger is prevented from engaging the bent of the tumbler. When the lock is right home, the side lever head depresses the sear, thus disengaging the bent of the sear from the bent of the firing pin, so allowing the long arm of the lock spring to carry the firing pin forward on to the cap, exploding the charge.

The depression of the sear is so timed that the firing pin cannot be released until the lock is in the firing position.

Method of instruction.

To prepare the gun.—Load. Open the rear cover. Remove the regulating lever, trip gear cap and

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trigger bar. Engage the trigger bar with the tail of the gun lock trigger and the trigger bar lever.

Demonstration.—Using gun and cut lock.

Explanation.—(Using gun and cut lock.)

(1) Pressure maintained on finger trigger.
(2) Trigger bar held back.
(3) Tail of trigger held back before lock goes home.
(4) Nose of trigger and bent of tumbler.
(5) Depression of sear.
(6) Action of lock spring.
(7) Timing of sear.

Interrogation.

xiv. *Action inside the lock* when pressure on the finger trigger is released. When pressure is released from the finger trigger, the layshaft spring, acting on the trigger bar lever, forces the latter and the trigger bar forward so that, when the lock travels forward and the sear is depressed, the nose of the trigger and bent of the tumbler engage, thus holding the firing pin to the rear.

Method of instruction.

To prepare the gun.—Load. Open the rear cover, remove the trigger bar and engage the trigger bar with the tail of the gun lock trigger and trigger bar lever.

Demonstration.—Using gun and cut lock.

Explanation.—(Using gun and cut lock.)

(1) Trigger bar returned to its normal position when pressure on the finger trigger is released.
(2) Depression of sear.
(3) Nose of trigger and bent of tumbler.

Interrogation.

xv. *Action of the loading catch.*—Is similar to that of the ·303-in. M.G., Mk. VI.

xvi. *Firing action—Single shots.*—Unlike that of the ·303-in. M.G. the ·5-in. M.G. will be fully loaded, i.e. the extractor is gripping a live round in the chamber and one in the feed block. Firing single shots is effected by the position of the regulating lever of the trip gear.

With the regulating lever set at " R," the stem of the lever is so positioned that, when the layshaft rotates, the fixed lug on the trip gear plunger makes contact with the stem of the regulating lever and the trip gear plunger is drawn back into its housing.

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During this action the trigger bar lever, being engaged with the trigger bar, causes the gun lock trigger to be withdrawn and the firing pin to be propelled forward on to the cap exploding the charge. The trip gear plunger is thus fully withdrawn, so freeing the trigger bar lever from engagement with the plunger, the layshaft spring, acting on the trigger bar lever, forces the latter and the trigger bar forward.

When pressure is released from the finger trigger, the layshaft returns to its normal position. The trip gear plunger, owing to the action of its spring, is forced outwards, engaging the lug on the trigger bar lever between the layshaft spring and the trip gear plunger.

Method of instruction.

To prepare the gun.—Load, set the regulating lever at "R," open the rear cover, remove the trigger bar and engage the trigger bar with tail of the gun lock trigger and trigger bar lever.

Demonstration.—Press the trigger; trigger bar lever locked in position until the lock is fired; the trigger bar lever becomes free. Simulate the action of the trigger bar and spring by pushing the trigger bar forward; trigger released and re-engagement of trigger bar lever. Remove the trip gear cap and show action.

Explanation.

(1) Regulating lever at "R."
(2) Trigger pressed.
(3) Lug on trip gear plunger engaging with stem of regulating lever.
(4) Lock fired.
(5) Trigger bar lever free.
(6) Action of layshaft spring.
(7) Trigger released.
(8) Final position of trigger bar lever.

Interrogation.

xvii. *Safety devices.*—Are similar to that of the ·303-in. M.G., Mk. VI.

3. Method of Instruction.

i. *Object.*—As for the ·303-in. M.G., Mk. VI.

ii. *Equipment required.*—As for the ·303-in. M.G., Mk. VI.

iii. *Sequence of instruction.*—The following is the sequence in which instruction in mechanism will be given.

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Each stage should be thoroughly understood before the next is begun.

The method of instruction is set out for each stage.

(*a*) To load.
(*b*) To fire.
(*c*) To unload.
(*d*) Action on recoil.
(*e*) First action in the feed block (left or right-hand feed block).
(*f*) Backward rotation of the crank.
(*g*) Second action in the feed block.
(*h*) Backward movement of the lock.
(*i*) Cocking action of the lock.
(*j*) Action of the fuzee spring.
(*k*) Forward movement of the lock.
(*l*) Firing action, first shot.
(*m*) Firing action, subsequent shots.
(*n*) Action inside the lock when pressure on the finger trigger is released.
(*o*) Action of the loading catch.
(*p*) Firing action, single shots.
(*q*) Safety devices.

NOTE.—It may be necessary to remove the front and rear packings to ensure easy movement of the recoiling portions in demonstrating.

4. STOPPAGES

1. The stoppages which occur on the ·5-in. M.G., Mk. V, and the method and sequence of instruction are similar to those of the ·303-in. M.G., Mk. VI, with particular attention to the following points :—

i. *No.* 1 *position* of crank handle (adjusting the fuzee spring). If difficulty is experienced in adjusting the fuzee spring by means of the vice pin, adjust by means of the fuzee spring tube. When increasing or decreasing the weight, rotate the tube in the opposite direction to that in which the vice pin would be rotated.

ii. *No.* 2 *position* of crank handle (separation in the chamber).—Having inserted the clearing plug into the chamber as far as it will go, rest the handle of the clearing plug against the left side of the breech casing. With the handle upright, the lock will foul the handle and prevent the pin of the clearing plug going right forward.

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iii. *No. 3 position* of crank handle.
Bad cross feed.

(1) Method of preparation for instructional purposes.
Pull out the fourth cartridge in the belt about half an inch ; half load ; pull down on the loading catch chain and engage the tail of the crank handle with the loading catch ; pull the crank handle slowly to the rear until the slide has moved outwards to its maximum position ; pull the belt to the left or right front ; pull the crank handle back on to the roller and ease forward.

(2) Immediate action.—Difficulty will be experienced in withdrawing the recoiling portions by the method employed for the ·303-in. M.G., Mk. VI. Therefore the following procedure will be adopted:
(i) Pull down on the chain actuating the loading catch and pull the crank handle back until the tail of the crank handle is against the loading catch.
(ii) Place the fingers of the left hand on the feed pawls.
(iii) Pull back the crank handle slightly so as to free the pawls, press down on the pawls and at the same time allow the crank handle to go forward until the recoiling portions have gone fully forward.
(iv) Hang the lock, remove the belt from the feed block, attending to the points laid down for the ·303-in. M.G., Mk. VI.
NOTE.—If no loading catch is fitted, some form of leverage will be required to withdraw the recoiling portions.

(3) A defective bullet guide spring may give the same indication as " thick rimmed cartridge " and " damaged extractor grooves," etc.

5. BELT FILLING

The method of inserting the rounds in the belt is similar to that of the ·303-in. M.G., Mk. VI, with the following differences :—

Insert each round into the belt as far as it will go, then, using the cartridge positioning machine, force each round into its correct position in the belt, i.e. until the front of the cartridge case is in the line with the double thickness of the belt.

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NOTE.—The belt, when passing through the feed block, fits into a guide-way in the bottom surface of the feed block on the inside. Therefore, if the round is not correctly positioned in the belt, the base of the cartridge or tip of the bullet will foul the side of the feed block, or the double part of the belt being too far forward in the feed block, may jam in the bullet way, so causing a fault in the feed.

Before firing, an inspection of belts will always be carried out to ensure that the rounds are correctly positioned.

6. MAINTENANCE—GUNNERY

The maintenance of the 5-in. M.G., Mk. V, is similar to that of the ·303-in. M.G., Mk. VI, with the following differences :—

i. To clean the barrel.—In oiling the bore, the oiled flannelette will be approximately 4 in. by 4 in. ; in drying the bore, a piece of flannelette approximately 4 in. by 8 in. will be used ; fold the flannelette in four before inserting in the eye of the cleaning rod and ensure that the end of the rod is surrounded by the flannelette.

ii. Wire gauze is issued in pieces approximately $3\frac{5}{8}$ in. by $3\frac{1}{4}$ in. To fit the gauze, turn the shorter sides towards the centre so that the longer sides form an "S," coil the gauze tightly round the thicker portion of the cord, leaving sufficient gauze to wrap tightly round the thin portion of the cord.

7. POINTS BEFORE, DURING AND AFTER FIRING

The points to be attended to before, during and after firing, together with the method of instruction, are similar to those of the ·303-in. M.G., VI.

8. REPAIRS AND ADJUSTMENTS

The repairs and adjustments are similar to those of the ·303-in. M.G., Mk. VI, with the following differences :—

i. Instructions for weighing and adjusting the fuzee spring.

(*a*) The weight of the fuze spring should be between 14 and 16 lb.

(*b*) The fuzee spring can be adjusted by means of the vice pin, or by rotating the fuzee spring tube. To increase or decrease the weight of the fuzee

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spring, rotate the fuzee spring tube in the opposite direction to that of the vice pin.

ii. Instructions for the renewal of packings.

(*a*) The weight of the recoiling portions should be between 6 and 8 lb.

(*b*) There being no bullet lead on the face of the barrel, the barrel will always be assembled in one position, i.e. the barrel number will either be at the top or the bottom according to its position before stripping.

(*c*) The front packing.—The length of asbestos string required depends on the thickness of the string and, as the packing required is more than that of the ·303-in. M.G., thick packing, if obtainable should always be used. If only thin packing is available, it is recommended that the string be plaited or doubled.

iii. Instructions for weighing the recoiling portions.—The weight of the recoiling portions should not exceed 8 lb.

9. EXAMINATION OF MACHINE GUNS, MOUNTINGS, ETC.

1. General remarks.—As for the ·303-in. M.G., Mk. VI, Pamphlet No. 2.

2. Points for examination.

i. *Gun.*—

(*a*) Gland and gland locking piece.—Gland free from burrs, serrations and screw threads in good condition. Gland locking piece not damaged and engages correctly with gland ; gland locking piece, keeper screw in good condition.

(*b*) Steam tube.—Head of steam tube correctly positioned and retained by its keeper screw. Baffle plug correctly assembled. Examine for movement of the slide valve. This can be ascertained by giving the gun a rocking motion, when the movement of the slide valve will be distinctly heard.

(*c*) Rubber joint ring.—In good condition ; note, when assembling the gun into the mounting, that the joint ring is a correct fit.

(*d*) Screwed plugs.—In good condition ; threads of plugs and screwed holes in barrel casing not damaged.

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(*e*) Barrel casing—not damaged.

(*f*) Front cover.—Catch engaging correctly and hinge pin and check nut secure. Extractor stop secure.

(*g*) Rear cover.

(1) Trigger bar and spring.—Split keeper pin positioning trigger bar correct; examine trigger bar for free working; test action of spring.

(2) Rear cover catch.—Automatic fastening when cover is lowered; axis pins and keeper pins correct.

(*h*) Rear cross-piece.—Axis pin, check nut and split keeper pin secure; rear crosspiece engaging correctly with side plates of breech casing, "T" fixing pin fitting correctly.

(*i*) Bottom plate.—Bracket for engagement of trigger guard carrier catch securely fastened.

(*j*) Mounting base.—Free from burrs; hole for recoil pin clear and not damaged.

(*k*) Ejection tube sleeve.—Clean and free from rust.

(*l*) Trigger guard carrier.

(1) Assembles correctly to bottom plate.

(2) Ejection tube.—Clean and free from rust; bush axis and keeper pin correct; plunger, spring and retaining pin, forming cartridge check, functioning correctly.

(3) Layshaft lever bracket and lever.—Bracket secure; layshaft lever working correctly and secured by keeper screw.

(4) Trigger guard carrier catch.—Working correctly, clean and free from rust.

(5) Loading catch.—Examine for correct working; note the action of the spring when pressure is released; spring tension is adjusted by repositioning the sleeve.

(6) Trigger guard and pistol grip.—Assembles correctly to trigger guard carrier and securely held by two fixing screws.

(7) Trigger mechanism.—Working freely, clean and free from damage.

(8) Safety catch.—Working correctly; thumbpiece assembled on correct side.

(*m*) Right outside plate.

(1) Layshaft assembly in good condition and working correctly; layshaft bracket secure. Trip gear cap correctly assembled; test the action of the trip gear.

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(2) Extractor safety stop.—Split keeper pins secure ; test for free working.

(3) Check lever securely held by collar and split pin.

(4) Crank handle secure, keeper screw in position.

(5) Roller correctly assembled.

(6) Right outside plate not damaged.

(*n*) Left outside plate.

(1) Fuzee spring assembly.—Bracket in good condition and fits correctly to stud on outside plate. Threads on adjusting screw in good condition. Vice pin not bent. Split keeper pin retaining screwed nut secure. Fuzee spring tube in good condition. Hook of rod in good condition, rod not distorted. Fuzee and chain in good condition, fuzee engages correctly to crank.

(2) Left outside plate not damaged.

(*o*) Barrel.—Outside of barrel free from rust and not damaged, no rust in cannelure, barrel trunnions free from burrs. Extractor grooves on face of barrel free from burrs. Recess in barrel block examined for burrs. Examine the interior of the barrel carefully for rust, cuts, erosion, nickelling, cord, wear and bulges, etc., as follows :—

(1) First with the eye close to the breech, then with the eye some inches from the breech, examine the bore, rotating the barrel very slowly. Erosion may be found in the lead.

(2) The barrel should now be reversed and examined from the muzzle in a similar manner.

(*p*) Feed block.—Examine the stud for burrs ; examine for flaws in the top and bottom levers ; correct assembly of levers. Split keeper pin in position. Feed and retaining pawls not damaged and working correctly. Cartridge guide spring and retaining spring examined.

(*q*) Resistance piece.—Free from burrs ; engages correctly in breech casing.

(*r*) Lock.—Strip and examine ; free from rust and damage ; ensure that the face of the extractor is free from fouling ; remove the gib and spring, examine the housing for rust ; extractor grooves not damaged. Extractor detent working correctly.

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(*s*) Side plates.

(1) Left side plate clean and free from rust, side plate spring correct, flanges free from burrs.

(2) Right side plate clean and free from rust, side plate spring correct, flanges not burred, connecting rod not damaged, connecting rod spring correct.

(*t*) Assemble the recoiling portions, first ensuring that the packings are correct, test the weight of the recoiling portions; if they are too heavy, examine for :—

(1) Tight packings.

(2) Damaged side plates of breech casing.

(3) Slightly bent or damaged side plates.

(*u*) Fill the barrel casing with water and work the recoiling portions; there should be no leakage.

(*v*) The lock will be tested as follows :—

(1) Side levers and extractor levers.—Remove the feed block and keep the front cover raised. Draw back the crank handle and let it go slowly forward on to the check lever; if correct, the extractor should now be in its highest position.

(2) Bents of sear and firing pin.—Pull the crank handle on to the roller, press the trigger, and, while maintaining pressure, let the crank handle go slowly forward on to the check lever. The extractor should be in its highest position before the sear releases the firing pin.

(3) Extractor.—Remove the lock, examine for burrs and flaws; extractor detent working correctly.

(4) Nose of trigger and bent of tumbler.—Cock the lock, release the sear; the firing pin should be held back.

(5) Firing pin.—No part broken; examine for flaws.

(6) Lock spring.—Test the weight as follows :—Fully cock the lock, place the bottom of the lock casing on a flat surface, place the loop of the spring balance over the side lever head and, with the left hand on top of the lock, draw the side lever head upwards with the spring balance. The weight recorded should be from 15 to 18 lb.

NOTE.—The loop of the spring balance will be approximately $\frac{3}{8}$-in. from the connecting rod end of the side lever head.

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ii. *Mounting.*—As for the ·303-in. M.G., Mk. VI.
iii. *Spare parts and tools.*—As for the ·303-in. M.G., Mk. VI
iv. *Belts and belt boxes.*—As for the ·303-in. M.G., Mk. VI.

3. Method of instruction.—As for the ·303-in. M.G., Mk. VI.

10. GENERAL HANDLING BY THE GUNNER

This is similar to that of the ·303-in. M.G., Mk.VI.

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APPENDIX

·5-IN. VICKERS MACHINE GUN, MK. V

Plates 1 to 11

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Key to Plate 1

1. Ring, joint, Mk. II (Rubber).
2. Barrel casing.
3. Plug, screwed, No. 2.
4. Catch, front cover, Mk. IV.
5. Cover, front, Mk. IV.
6. Block, feed, R.H., Mk. II.
7. Cap, trip gear, Mk. II.
8. Left plate of breech casing.
9. Catch, rear cover, Mk. IV.
10. Tube, fuzee spring.
11. Pin, " T," fixing rear crosspiece, Mk. II.
12. Rear crosspiece, Mk. II.
13. Resistance piece, Mk. V.
14. Fuzee, with chain, Mk. II.
15. Lever, loading catch.
16. Pistol grip.
17. Catch, safety, Mk. V.
18. Trigger, finger, Mk. III.
19. Carrier, trigger guard, Mk. III.
20. Bush, axis, trigger guard carrier.
21. Seating for front of ejection tube.
22. Screw, adjusting, fuzee spring. (With vice pin.)
23. Mounting base.
24. Barrel, Mk. I.

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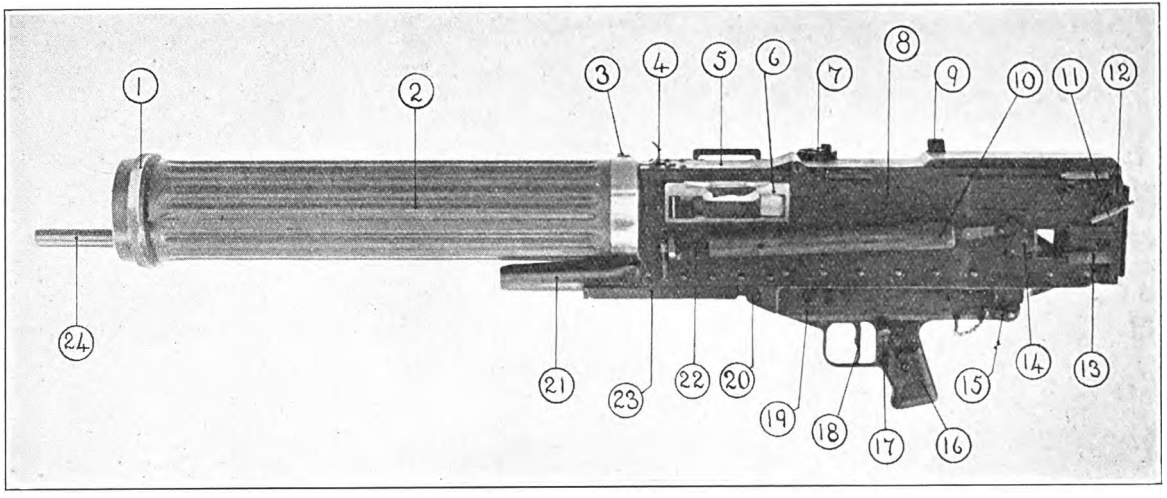
PLATE 1

[*To face page 34.*



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Key to Plate 2

1. Rear crosspiece, Mk. II.
2. Cover, rear, Mk. VI.
3. Right plate of breech casing.
4. Catch, rear cover, Mk. IV.
5. Safety stop.
6. Cap, trip gear, Mk. II.
7. Cover, front, Mk. IV.
8. Catch, front cover, Mk. IV.
9. Plug, screwed, No. 2.
10. Barrel casing.
11. Ring, joint, Mk. II (rubber).
12. Barrel, Mk. I.
13. Gland, packing, Mk. III.
14. Seating for front of ejection tube.
15. Plug, screwed, No. 2.
16. Mounting base.
17. Block, feed, R.H., Mk. II.
18. Housing of layshaft and trip gear.
19. Bracket, check lever.
20. Lever, check.
21. Handle, crank, Mk. III.
22. Bracket for engagement of trigger guard carrier catch.
23. Crank, Mk. II.
24. Roller, Mk. II. Collar, Mk. II and No. 2 split pin.
25. Loading catch.
26. Thumb-piece, trigger guard carrier catch.
27. Pistol, grip.
28. Trigger, finger, Mk. III.
29. Bracket, for lever, layshaft, No. 4.
30. Tube, ejection, Mk. III.
31. Axis, trigger guard carrier.
32. Carrier, trigger guard, Mk. III.

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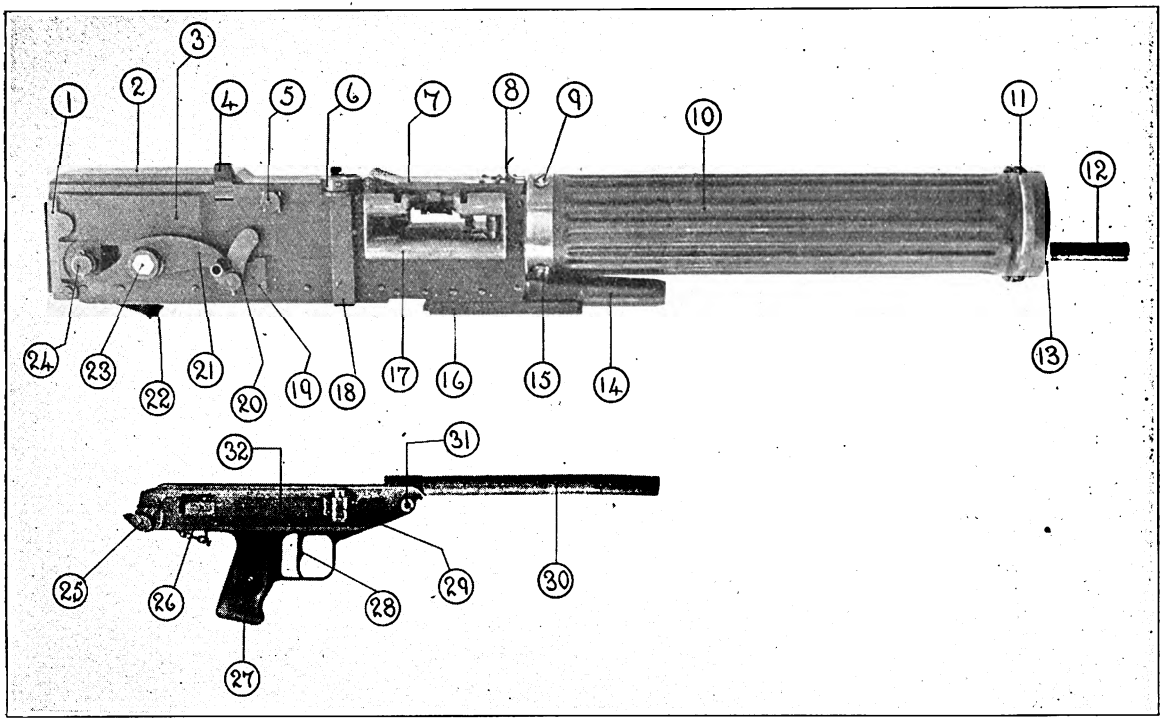

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Key to Plate 3

1. End cap.
2. Barrel casing.
3. Hole, for filling barrel casing with water.
4. Housing for layshaft and trip gear.
5. Housing for spring and plunger, extractor safety stop.
6. Bracket, check lever.
7. Right outside plate.
8. Left outside plate.
9. Stud for bracket, fuzee spring.
10. Trunnion block.

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PLATE 3

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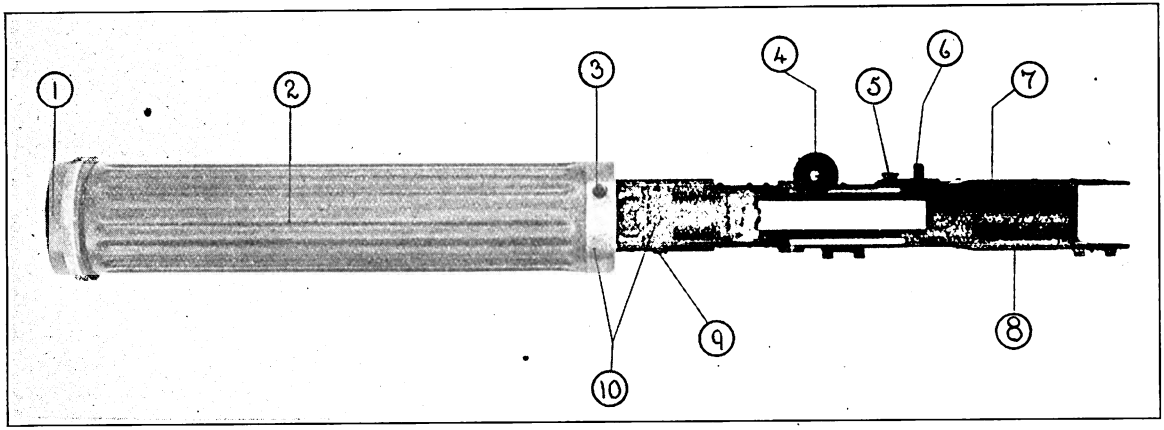

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Key to Plate 4.

1. Carrier, trigger guard, Mk. III.
2. Hole for spindle of loading catch.
3. Recess for thumb-piece, trigger guard carrier.
4. Bracket for layshaft lever.
5. Hole for axis pin, connecting ejection tube.
6. Tube, ejection, Mk. III.
7. Hole for axis pin, connecting trigger guard carrier.
8. Recess for assembly of plunger and spring, forming the cartridge check.
9. Lever, loading catch.
10. Chain, M.G., with two M.G. hooks, for lever, loading catch.
11. Screw, lever, loading catch.
12. Spindle, loading catch, Mk. II.
13. Spring, loading catch.
14. Pin, split, bush axis, trigger guard carrier.
15. Bush, axis, trigger guard carrier.
16. Plunger, ejection tube, Mk. II.
17. Spring, plunger, ejection tube.
18. Pin, plunger, ejection tube.
19. Guide for spring, trigger guard carrier catch.
20. Pin, catch, trigger guard carrier.
21. Sleeve, loading catch.
22. Screw, sleeve, loading catch.
23. Spring, trigger guard carrier catch, Mk. II.
24. Catch, trigger guard carrier, Mk. II.
25. Screws, trigger guard carrier catch.
26. Thumb-piece, trigger guard carrier catch.
27. Screw, retaining, No. 4 layshaft lever.
28. Lever, layshaft, No. 4.

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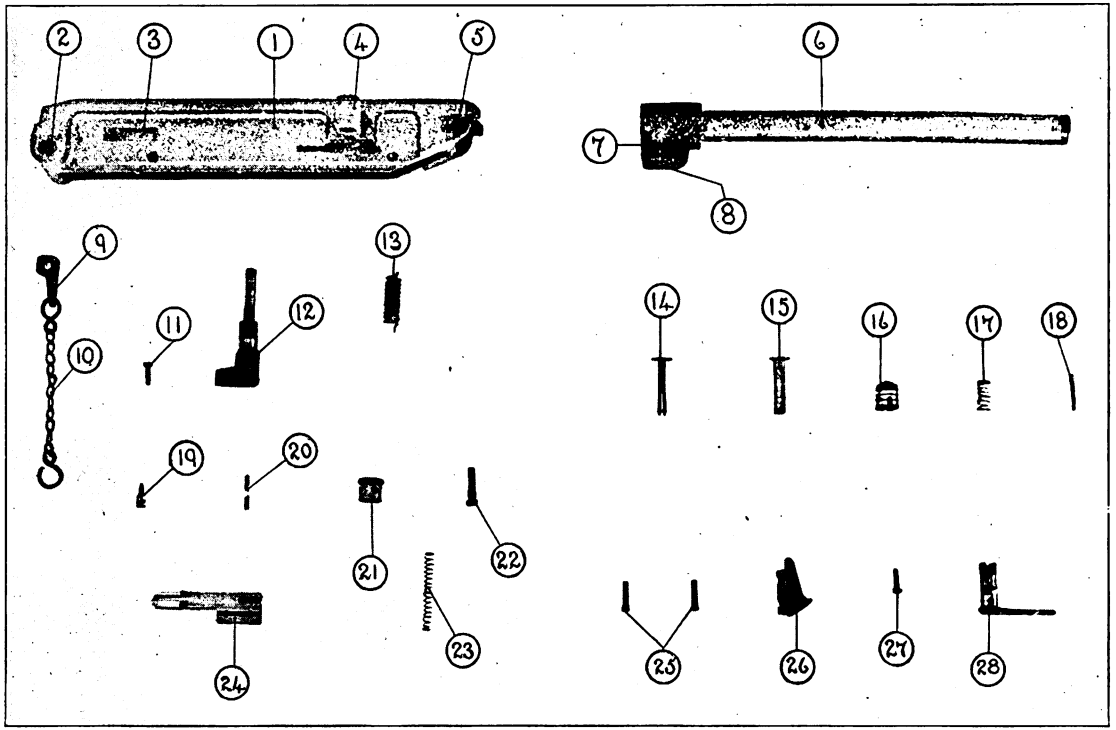

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Key to Plate 5

1. }
2. } Guard, trigger, Mk. III.
3. Side-piece, pistol grip, right.
4. Side-piece, pistol grip, left.
5. Screw, side-piece, pistol grip.
6. Recess for layshaft lever.
7. Sliding bar of finger trigger.
8. Trigger, finger, Mk. III.
9. Roller, finger, trigger.
10. Pin, axis, roller, finger trigger, front.
11. Spring, finger trigger.
12. Rod, finger trigger, spring.
13. Roller, finger trigger.
14. Pin, axis, roller, finger trigger, rear.
15. Plunger, safety catch, Mk. II.
16. Spring, safety catch, Mk. II.
17. Catch, safety, Mk. II.
18. Screw, safety catch.
19. Screws, fixing, trigger guard.

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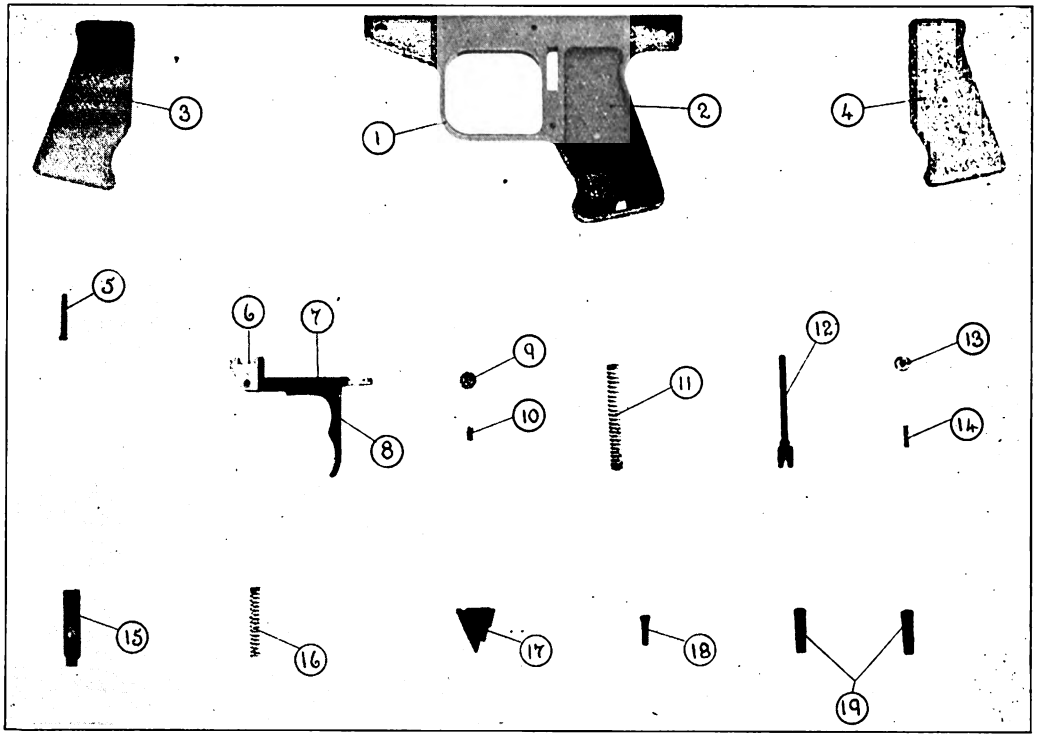

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Key to Plate 6

1. Lock casing.
2. Upper extractor stop of lock casing.
3. Interrupted flange on casing.
4. Lever, side.
5. Steps of side levers.
6. Side levers.
7. Extractor, Mk. III.
8. Horns of extractor.
9. Recess for gib.
10. Hole for firing pin.
11. Recess for extractor detent.
12. Extractor grooves.
13. Lever, extractor, left.
14. Lever, extractor, right.
15. Bents of extractor levers.
16. Spring, lock.
17. Pin, firing.
18. Recess in firing pin.
19. Projection of firing pin.
20. Bent of firing pin.
21. Trigger, lock.
22. Tumbler.
23. Bent of tumbler.
24. Tail of tumbler.
25. Head of tumbler.
26. Pin, tumbler.
27. Plunger detent, extractor.
28. Plate, detent, extractor.
29. Spring, detent, extractor.
30. Detent, extractor, Mk. II.
31. Pin, trigger, lock.
32. Sear.
33. Bent of sear.
34. Spring, sear.
35. Cover, gib spring.
36. Spring, gib, Mk. III.
37. Gib, Mk. III.
38. Bush, axis, side levers, Mk. II.
39. Pin, split, bush axis side levers, Mk. II.

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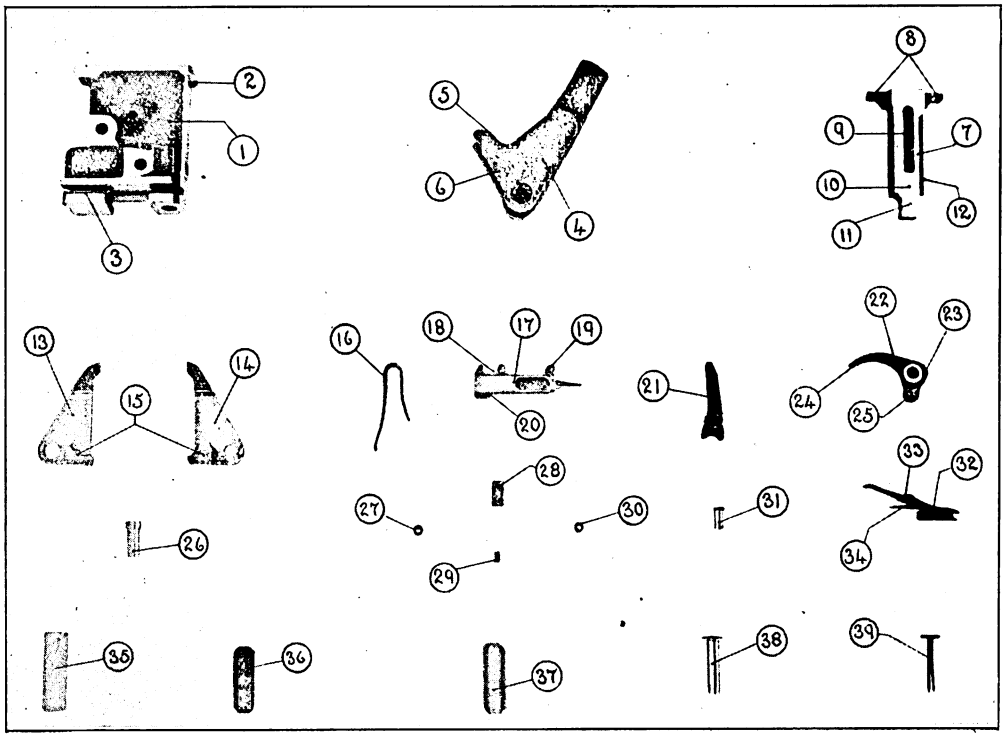

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Key to Plate 7

1. Block, feed, R.H., Mk. II.
2. Pin, axis, pawls, retaining, feed block.
3. Pawls, retaining, R.H., feed block, Mk. I.
4. Spring, bullet guide.
5. Pin, axis, top pawls, feed block.
6. Pin, split, levers, feed block.
7. Slide, R.H., feed block.
8. Spring, pawls retaining, R.H. feed block.
9. Lever, top, R.H. feed block.
10. Stud of top lever, for engagement with slide.
11. Stud of bottom lever for engagement with recess in barrel block.
12. Lever, bottom, feed blocks, Mk. II.
13. Spring, top pawl, feed block.
14. Pawl, top, R.H. feed block.

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Key to Plate 8

1. Cover, rear, Mk. VI.
2. 4. For connection to left plate by pins, hinge, rear cover.
3. 6. Ramps.
5. Recess for trigger bar.
7. Cover, front, Mk. IV.
8. Spring, front cover, extractor stop.
9. Rear cross-piece, Mk. III.
10. Hole, for inspection of barrel.
11. Bar, trigger, Mk. V.
12. Recess for engagement of trigger bar spring.
13. Spring, trigger bar, long.
14. Pin, split, trigger bar, No. 2.
15. Catch, rear cover, Mk. IV.
16. Spring, rear cover catch, Mk. III.
17. Pin, retaining, rear cover catch.
18. Catch, front cover, Mk. IV.
19. Pin, joint, front cover, Mk. II.
20. Nuts, check, cover, joint, Mk. II.
21. Pin joint, rear cross-piece.
22. Pins, hinge, rear cover.
23. Collars, rear cover, hinge pins.
24. Pins, split, rear cover, hinge pins.
25. Pin, split, front cover catch pin.
26. Pin, retaining, front cover catch.
27. Spring, front cover catch, Mk. V.
28. 29. Pin, split, nut joint pin.
30. Nut, check, rear cross-piece.
31. Pin " T," fixing rear cross-piece.

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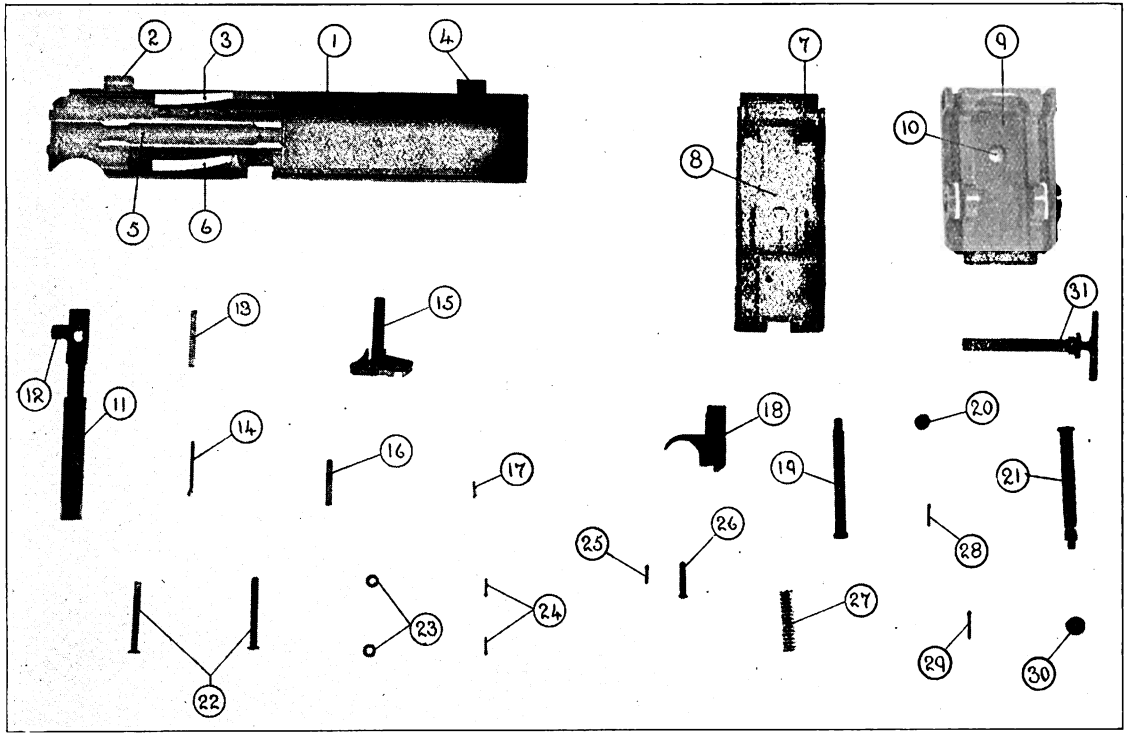

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Key to Plate 9

1. Resistance piece, Mk. V.
2. Left slide.
3. Recess for adapter of finger guard.
4. Right slide.
5. Axis for roller and collar.
6. Roller, resistance piece, Mk. II.
7. Collar, resistance piece roller, Mk. II.
8. Pin, split, collar, roller, No. 2.
9. Lever, check.
10. Collar, check lever.
11. Pin, split, collar, check lever.
12. Layshaft, Mk. II.
13. Head of layshaft, containing trip gear.
14. Screw, retaining, layshaft.
15. Cap, trip gear, Mk. II.
16. Screw, cap, trip gear.
17. Lever, trigger bar, Mk. III.
18. Plunger, trip gear.
19. Spring, plunger, trip gear.
20. Pin, retaining, spring, trip gear.
21. Lever, regulating, trip gear.
22. Cap, safety stop, Mk. II.
23. Plunger, safety stop.
24. Spring, plunger, safety stop.
25. Pins, split, cap, safety stop.

NOTE.—The spring layshaft is not shown.

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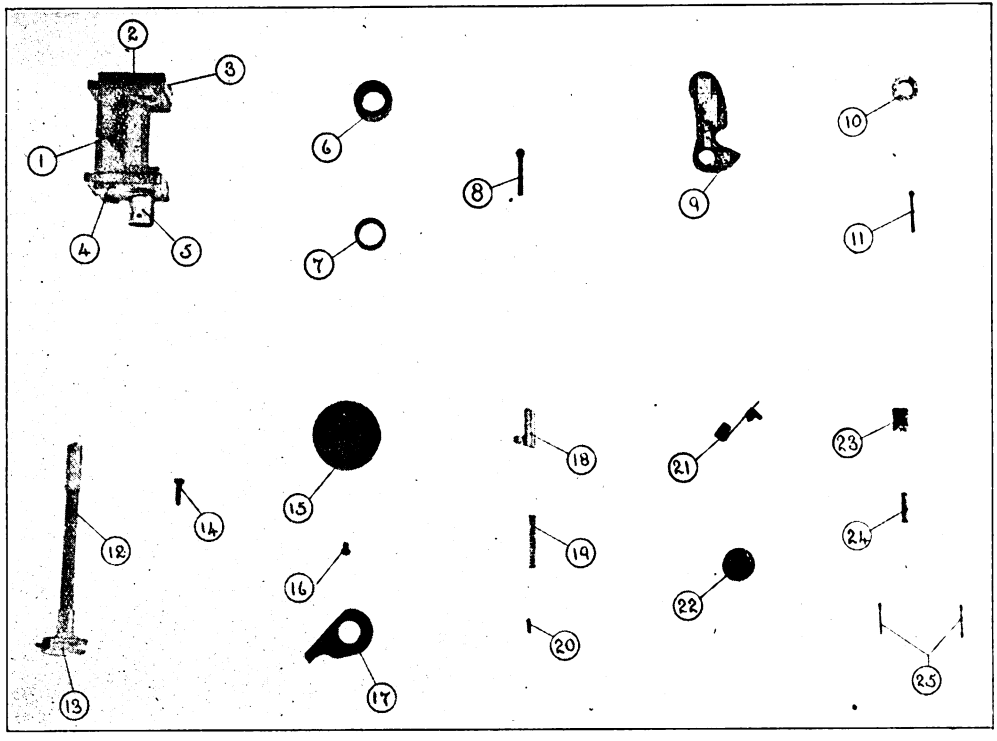

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Key to Plate No. 10

1. Tube, fuzee spring.
2. Hole for use of "T" fixing pin, or No. 5 punch for stripping purposes.
3. Spring, fuzee.
4. Rod, fuzee spring, Mk. II.
5. Collar, forming front seating of fuzee spring.
6. Hook, for engagement with fuzee.
7. Bracket, fuzee spring.
8. Screw, adjusting, fuzee spring.
9. Vice pin.
10. Nut, fuzee spring tube.
11. Pin, split, nut, fuzee spring tube.
12. Fuzee with chain, Mk. II.

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PLATE 10

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Key to Plate 11

1. Barrel, Mk. I.
2. Cannelure.
3. Recess for engagement of stud on bottom lever of feed block.
4. Barrel trunnions.
5. Plate, side, right, Mk. II.*
6. Handle, crank, Mk. III.
7. Pin, fixing, crank handle.
8. Hole for connecting side plate to trunnion on barrel block.
9. Spring, side plate.
10. Rod, connecting.
11. Pin, crank.
12. Spring, connecting rod.
13. Crank, Mk. II.
14. Hole in crank for inspection of barrel.
15. Spring, steam valve.
16. Front portions of steam valve.
17. Plunger, steam valve.
18. Ball, steam valve.
19. Rear portion of steam valve.
20. Spring, side plate.
21. Hole for connecting side plate to trunnion on barrel block.
22. Plate, side left.
23. Hole for connecting to crank.
24. Gland, packing, Mk. III.
25. Lock, gland, packing, Mk. III.
26. Screw, keeper, steam tube, Mk. III.
27. Screw, lock, packing gland, Mk. II.
28. Plugs, screwed, No. 2.
29. Tube, steam, No. 2.
30. Valve, steam tube.

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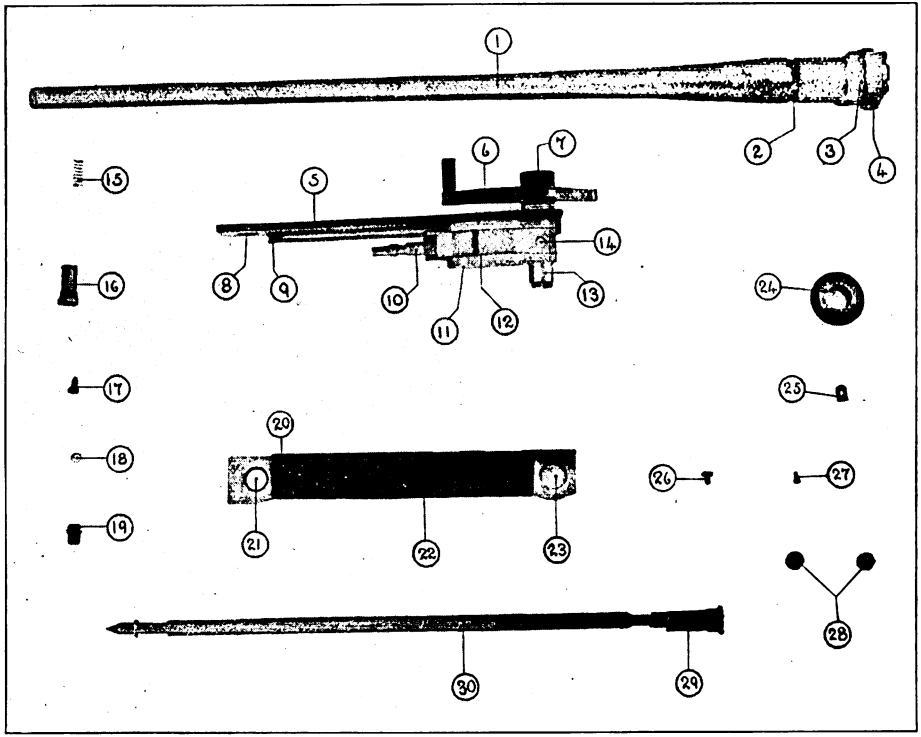

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